

58th ANNUAL REPORT

OF THE DIRECTOR TO THE HON. THE MINISTER FOR AGRICULTURE AND STOCK

(As required by "The Sugar Experiment Station Acts, 1900 to 1957")





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58TH ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS

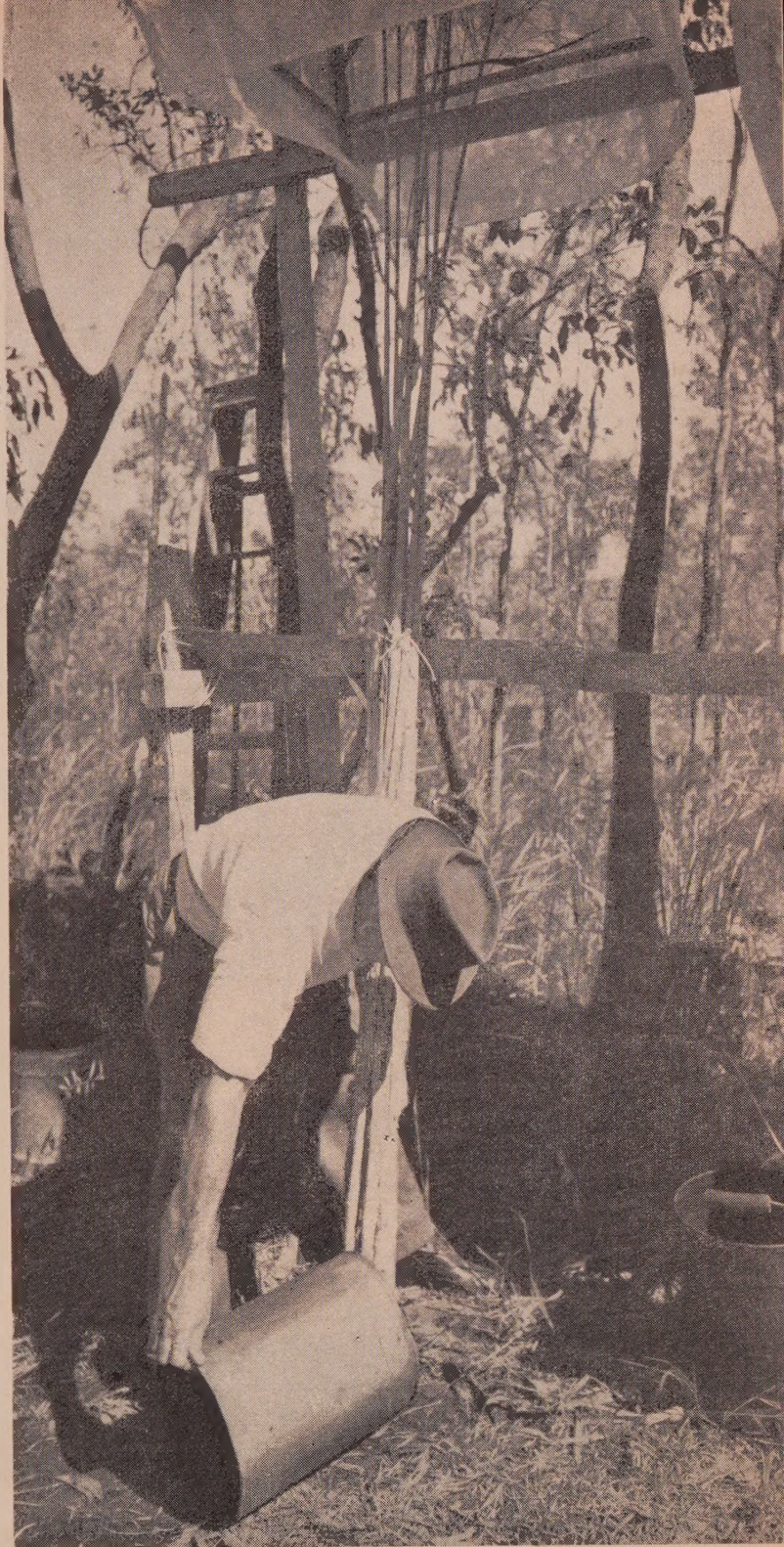
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Our Cover

This view of an Innisfail farm shows cane ready for harvesting, and the young crops for the following year.

Engraving by courtesy of
The Courier-Mail.



Setting up a lantern cross. Stalks are stood in a drum of solution.



Above—Q.57 on the Ingham Line.

Below—The Director addresses a gathering on the Lower Burdekin Experiment Station.

Top right—Seedlings in flats in the glass-house. Those being watered are four weeks old.

Bottom right—A large area cross on Meringa Station.



FIFTY-EIGHTH ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS

*To the Honourable the Minister
for Agriculture and Stock*

Dear Sir,

The period which is reviewed in this report covers the financial year from July, 1957 to June, 1958. It was, climatically, one of contrasts, including the disastrous drought in South Queensland in 1957 and the very serious flooding in Mackay and the Lower Burdekin in the early months of 1958. The effects of the former were to reduce production drastically in the affected areas for the 1957 crop, whereas the latter caused crop damage in limited areas for the 1958 season.

The remarkable aftermath of the southern drought was the phenomenal growth which took place once relief rains arrived. For the five months, February to June, 1956, conditions of soil moisture and temperature were ideal and the anticipation of further disaster was transformed into a near-peak crop in the southern districts. Simultaneously, throughout the Queensland sugar belt, a favourable, though late, growing season produced a cane tonnage which, on early estimates, will be an all-time record. Being mindful of our markets, this production is a mixed blessing and it proposes problems of some magnitude. At the time of writing the Sugar Board has announced the acquisition of only the "peak" plus seven and a half per cent. and, should this be the final amount to be acquired, large tonnages of cane will be left unharvested.

The year also witnessed the operation, for the first time in Queensland, of a large bulk sugar terminal at the port of Mackay and the development of two further terminals at Lucinda and Bundaberg respectively; the two lastmentioned will be in operation for the receiving and despatch of raw sugar during the 1958 season. These three terminals, together with the planned installations at Townsville and Mourilyan, and the

complementary bulk installations at the many mills concerned, represent a very large expenditure of sugar industry finances, but this expenditure will result in certain savings in handling and bag costs.

Insofar as the Bureau's activities for the year are concerned, this report summarises the work of the various divisions under the headings of soils and agronomy, plant breeding, entomology, pathology and mill technology. The work of the four Experiment Stations is dealt with in some detail, the usual industry statistics are appended, and the writer's introductory remarks cover, *inter alia*, the performances of the 1957 season and the prospects for 1958.

Hand in hand with the virile growth of the sugar industry in post war years there has been an even more rapid development in technical research and in services to both growers and millers. This springs from the greater demands for higher yielding and sweeter canes, for better control over pests and diseases, for investigation into agronomic problems, and for improved extension and advisory services; and there are numerically increasing requests for investigations into manufacturing and milling problems, for trouble shooting during the crushing season, and for advice and planning on mill improvements.

This healthy development has increased the reliance of the industry on the Bureau's services to an extent not visualised ten or fifteen years ago. One inescapable consequence has been a considerable increase in staff combined, naturally, with a growth in expenditure. To-day the Bureau staff totals 72 of which number three quarters are technical personnel. The sugar industry's share of Bureau expenditure, collected by levy at the rate of 4½d. per ton of cane crushed for the 1957 season, amounted to 0.27 per cent. of the value

of the raw sugar produced in that year. This is a low figure on world standards which assess adequate research expenditure at from one to two per cent. of the particular industry's income, but it must be kept in mind that the Queensland sugar industry expends other funds on research and investigation in addition to that contributed to the Bureau.

One cannot predict what the industry's future requirements might be, but it can be anticipated confidently that it will expect at least the present



Aerial spraying at Greenhill in the Cairns district—1958.

standard of productive research whether it be by varietal improvement or in other avenues of progress. Planned expansion of the industry will doubtless be a steady development in future years to conform to a rising Australian population and perhaps some increase in the export quota under the International Sugar Agreement. Parallel with such increased production it would, on past experience, be expected that Bureau services, staff and expenditure will also expand.

With the completion of the new Experiment Station building at Mackay and the new headquarters building in Brisbane all centres except

Meringa will be reasonably well equipped with office space and laboratory facilities. Some forward planning is desirable at Meringa, however, where facilities are inadequate and space is becoming a problem. Meringa, with a present staff strength of 16, is the headquarters of the Bureau's cane breeding and entomological research and, following the recently instituted decentralization policy, also contains units of the pathology, agronomy and mill technology divisions. Consideration should be given, in the near future, to the planning and erection of a new, composite, laboratory and office building at that centre.

The seedling sub-station in the Mourilyan area has already proved to be a very valuable adjunct to the cane breeding headquarters at Meringa. The canes selected in 1958 are of a high standard relative to the commercial varieties which are interplanted. The most unexpected development on this sub-station was that, following the concurrent planting on the Mourilyan and Babinda sub-stations of a large number of seedling varieties, (duplicate cuttings being planted at each centre), the subsequent selection showed that only one of the seedling canes was selected at both places. It had previously been thought that, with such similar climatic environments, the two sub-stations would not be necessary.

THE 1957 SEASON

The extent of the crushing season was from May 22nd to December 19th 1957, and the treated cane aggregated 8,945,617 tons. This was some 30,000 tons below the 1956 figure and it is remarkable that a greater difference was not recorded; the large deficiency in production in the south, resulting from the serious drought, was virtually made up by an increase in the more northern districts.

The area harvested to produce this tonnage was 364,985 acres, being a slight increase on the previous year. Although small areas continue to come into cane for the first time—being delayed development of assignments granted earlier—there is little yearly fluctuation in the gross harvested acreage.

The 94 n.t. sugar produced was 1,256,271 tons and this exceeded 1956 output by some 86,000

tons. A better cane/sugar ratio in 1956 was responsible for the sugar yield being higher while the cane yield was lower. Whereas this ratio reached the high figure of 7.66 in 1956 it was, for the 1957 season, only 7.12—a much more favourable figure. Throughout the State the sugar content of cane was high and, in the drought-stricken south, it was better than normal. The harvesting season was, in general, conducive to high sugar content. Fine, dry weather prevailed in most areas, preventing crop elongation but favouring the storing of sucrose.

In New South Wales the crop realised 303,086 tons of cane from which 36,840 tons of 94 n.t. sugar were manufactured.

It is established custom to make reference each year in this report to the total crushing for the State's 31 mills at the peak of the season. Over the seven weeks ending on October 19th, 1957 the average weekly aggregate was 425,857 tons which exceeds the 1956 figure by 38,133 tons.

The outstanding climatic feature of the 1957

season was the disastrous drought in the Bundaberg-Isis-Maryborough area. The first ten months of the year in Bundaberg brought only fifteen and a half inches of rain and the crushing season began on a drought-stricken crop except in those areas where irrigation facilities were available. Frosty conditions, which almost invariably march hand in hand with a drought, were fortuitously absent, and the affected areas were spared the extra loss which would have been caused by a lowered sugar content. The drought did, without doubt, cause serious district loss but it proved one point—if proof were necessary. The production per acre was far higher than in the 1932 and 1946 drought years (1932—7.1 t.p.a., 1946—14.3 t.p.a., and 1957—18.2 t.p.a.) illustrating in no uncertain manner the influence which modern cane varieties have had on crop production in very adverse years. After the 1957 experience growers need have no fear of a repetition of the 1932 disaster.

Serious floods in both the Burdekin and the Pioneer Rivers caused localised damage of some



Clearing land at Meringa Experiment Station.

magnitude but the overall production in both areas was not appreciably affected. It is a distressing fact that one of the major breachings of the Burdekin River banks, where serious farm damage was caused, was the result of clearing and cultivating land right to the river's edge.

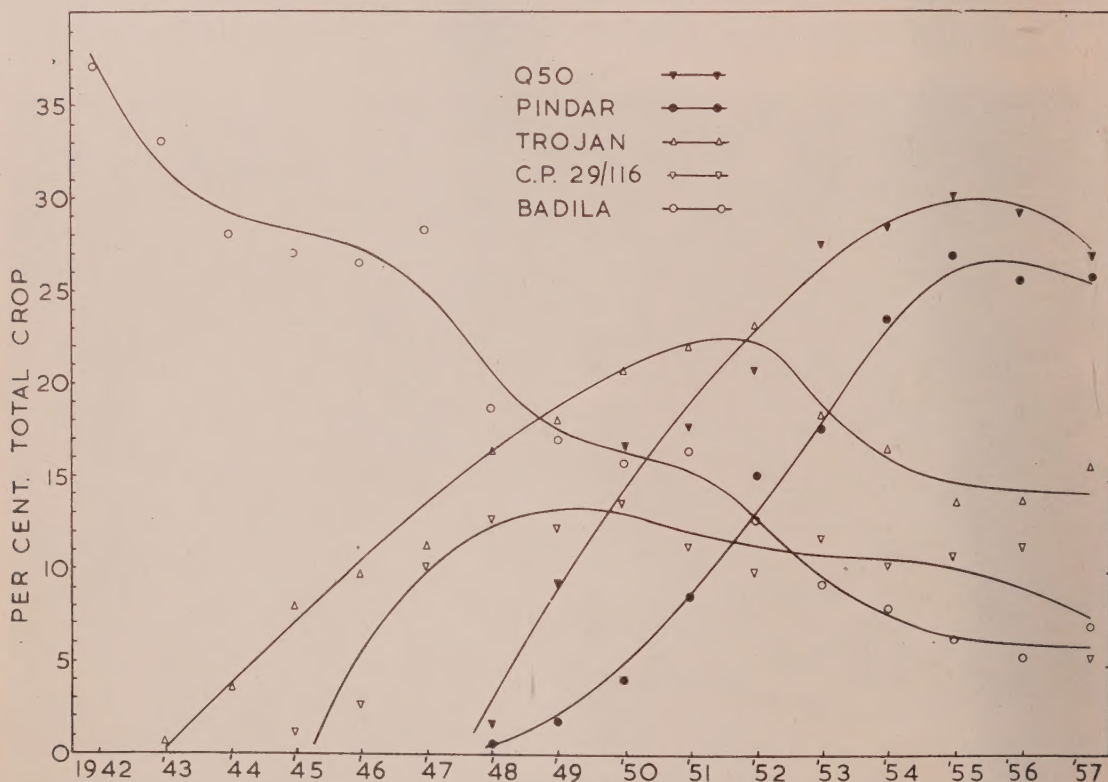
PROSPECTS FOR THE 1958 SEASON

In last year's report some brief reference was made to the five-year succession of good seasons through the sugar belt. A year later, and in retrospect, we are able to measure the effects of such climatic happenings as the 1956 cyclone in the north and the 1957 drought in the south. In both years the aggregate sugar produced was still in excess of the "peak", and it is apparent that such occurrences—serious as they doubtless are to the affected districts—do not reduce the industry to the stage of being unable to fill available markets. It is probable that the only

single-district factor which could have a major effect on overall production would be a very adverse season in Mackay where approximately a quarter of the State's sugar is grown; and even there it is difficult to conceive of a season so sub-normal that present day varieties would be very seriously affected.

The estimate prepared in May, 1958, of the forthcoming season's crop indicated an expectation of 9,966,000 tons of cane and an anticipated 94 n.t. sugar yield of 1,345,000 tons. These were record figures but, even so, they were lower than the aggregate of the estimates sent in by the individual mills, having been abated in some areas as the result of advice from Bureau district officers. An estimate, at the same time, received by industry organizations showed 10,424,000 tons cane and 1,380,000 tons 94 n.t. sugar.

With the advance of the season, and the harvesting of a proportion of the crop it was



Illustrating the decline of Badila, the rise and fall of Trojan, the probable falling off of C.P.29/116 and the levelling out of Q.50 and Pindar. Points on the curves represent percentages of the total crop.

apparent in some areas that crops were cutting-out below estimate and, more important still, they were of lower than estimated sugar content. But in other districts they have been up to early estimate and, in one or two cases, above that figure.

The Bureau's estimate disclosed that some 392,400 acres would be available for harvest—presupposing that all available sugar would be acquired by the Sugar Board—and this would be 27,400 acres higher than in 1957. Such a harvested acreage would also be a record. In last year's report the opinion was expressed that the industry's harvested area would stabilise itself between 360,000 and 380,000 acres. The only factors which might upset such a prediction—in the absence of another expansion phase—would be a change in the Lower Burdekin and Mackay towards growing more ratoon crops, or, in other words, moving closer to the theoretical 2 : 1 ratoon/plant ratio.

Irrespective of the estimated production and

acreage figures mentioned there is little doubt that the entire crop will not be acquired. The industry could find itself in very grave difficulties if this year's excess were harvested, processed and stored, and then was faced with a couple of "over-peak" crops in 1959 and 1960.

New South Wales production for the 1958 year is expected to reach 399,000 tons of cane and 47,100 tons of 94 n.t. sugar.

BUREAU INTERESTS AND ACTIVITIES

Lodging Resistance

Although a relatively new concept in cane breeding, the Bureau's work has achieved a considerable degree of success in a few short years. Q.57 was the first cane to give some promise in this direction and it performed very creditably during the 1956 cyclone. However it was rapidly superseded in lodging resistance by Q.66 and Q.67, both of which have attracted considerable attention on very rich lands, where all other canes lodge freely, and on flooded country where



Q.67 on the right—a lodging resistant variety—shows its superiority over Badila, on the left, which is recumbent and tangled.

they withstand the force of moving water. Indications to date are that Q.67, in particular, will rapidly find a place among the commercial varieties of the Lower Burdekin and the far north.

Certain other advanced seedlings, not yet allotted "Q" numbers, are also demonstrating a high degree of resistance to lodging under rich soil and adverse conditions. These are being tested intensively and extensively in the locations where lodging of crops increases harvesting costs and reduces sugar content.

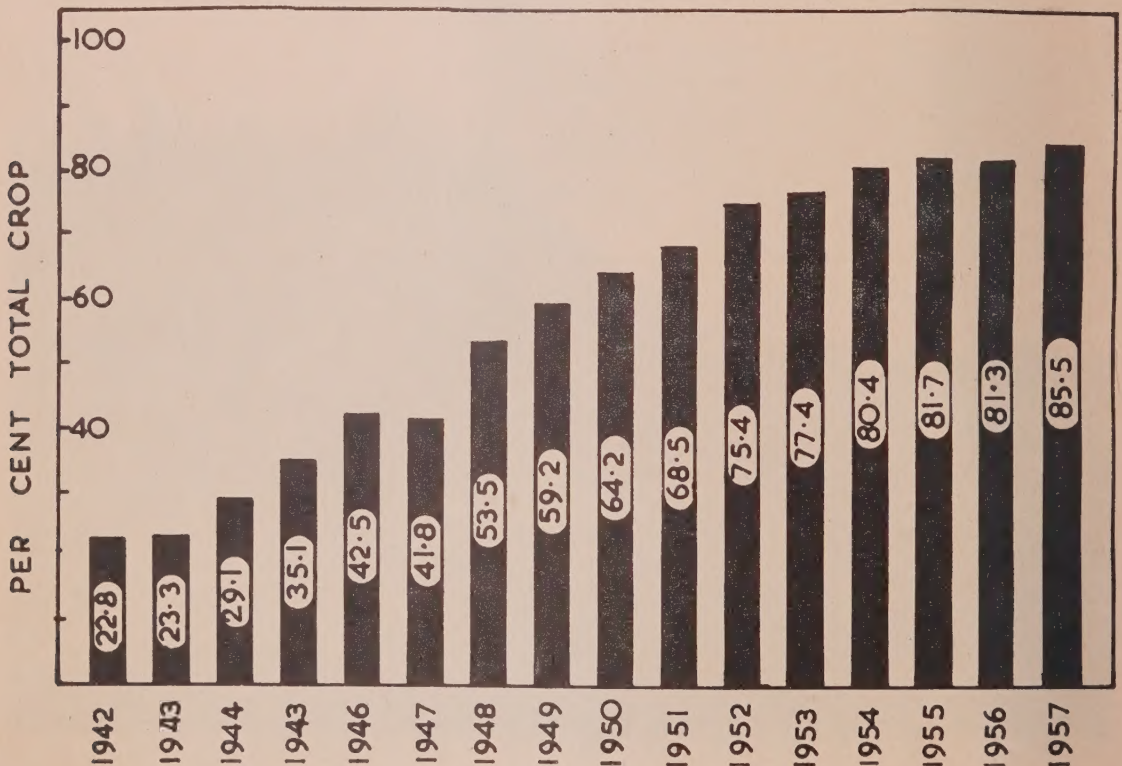
Nematode Investigations

Research into this little-understood problem appears to have begun simultaneously in Queensland and in certain overseas sugar producing countries. There is, as yet, no conclusive evidence that these organisms are reducing cane yields but some initial studies have disclosed higher than normal nematode populations in the soil where

poor growth patches occur. The Bureau's interest in the problem is also associated with the "poor ratooning" investigations in the Mackay and Bundaberg districts. The major problem which has to be faced, should nematodes prove to be the cause of crop losses, is the high cost of the presently available nematicides. These soil fumigants are very costly per acre treated and would not be economical in usage on a relatively low-value crop such as sugar cane. There is a very urgent need in agriculture generally for a cheap soil fumigant which will control, not only nematodes, but a host of other soil inhabiting fauna, fungi and bacteria.

Varietal Progress

Probably at no time in the past has the procession of new cane varieties marched so rapidly as in the last year or two. The new contenders for commercial honours are all superior in one respect or another to the present-day approved canes, and several of them promise to make an



Between 1942 and 1957 the percentage of Queensland bred varieties in the total crop has increased from less than 23 to over 85 per cent.

important impact on district production. Q.58, Q.63, Q.65 and Q.68 from Mackay will be grown extensively, particularly Q.58 which, in 1957, contributed 348,000 tons to Queensland's crop; Q.66 and Q.67 from Meringa and Ayr respectively are finding a place on rich and flooded lands; and Q.61 and Q.70 from Bundaberg are attracting more than passing attention in southern areas. At the moment Q.58 is the most advanced of these new varieties and its high, early sugar content and vigorous ratooning habit will encourage extensive trial plantings in most areas of the State. An important feature of some of these newer canes is that their sugar content is higher than that of most hybrid varieties, giving a promise of a return to the outstanding cane/sugar ratio which used to characterise our industry.

Q.57 in Babinda

Q.57 represented over a quarter of the Babinda crop in 1957 and exceeded in tonnage per acre the major variety, Pindar, by 31 per cent. This proportion of Q.57 had an appreciable effect on the average c.c.s. for the season since its average sugar content exceeded that for Pindar and Badila—the two major varieties—by 0.66 and 0.50 units respectively. It is pleasing to record that the growers of this area—which had experienced such low c.c.s. figures for a period of years—had followed Bureau advice to increase Q.57 plantings with a view to raising the average sugar content. Q.57 appears to be ideally suited to much of the Babinda area and it has proved its capacity to increase yields of cane while at the same time developing a sweeter juice.

It is a long time since the Babinda area began a season with higher c.c.s. than the neighbouring northern mill areas. Such was the case at the start of the 1958 season and much of the credit must go to the even higher proportion of Q.57 in the crop than is recorded above for the previous year.

Seedling Plot at Ingham

The early success achieved by the seedling sub-station at Mourilyan was responsible for sympathetic consideration being given to a request for a similar project in the Ingham area.

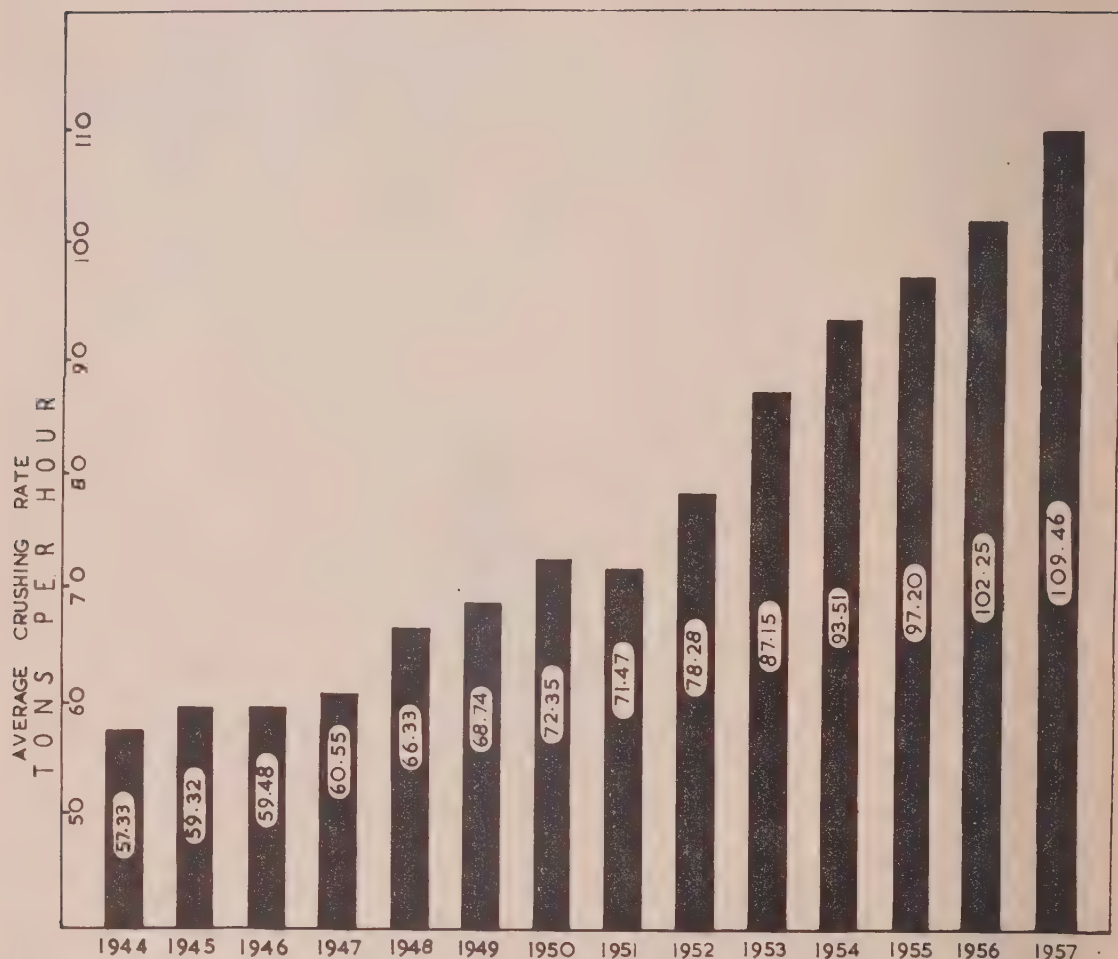
The relatively new Abergowrie area, with its proportion of rich alluvial lands, possesses cane growing problems which are inherent in the rich soils and the occasional floods. A selection of new varieties is desirable in this large district and already Q.67 has been planted out to the limit of available supplies in an attempt to solve the lodging problem. It is therefore planned, starting in 1959, to establish a variety introduction area in that locality so that promising seedling canes, bred in four other districts, can be tested in the local environment. It is not planned, at the present time, to establish a sub-station of the magnitude of that at Mourilyan, but the plot will develop in the future in accordance with the success of the venture and the local demand.

Mechanical Harvesting

This form of crop handling, the development of which has been intensified in the past year, justifies consideration of several agricultural factors which are bound up with mechanization. One of these is the breeding and growing of varieties which lend themselves more readily to machine harvesting, and our cane breeders have not lost sight of the need for erect, compact types with a uniform length of stalk and which remain erect after a pre-harvest burn.

It has also become very evident, when considering the use of the heavier types of mechanical harvesters, that the problem would be less difficult if cane were grown with wider interspaces than is traditional and conventional in Queensland. The limitations of a four feet six inch interspace have been demonstrated with at least one modern harvesting machine. It is many years since Bureau experimentation showed that, with the then grown varieties, there was no appreciable difference in the crops produced whether planted with 4'6", 5'0", 5'3" or 5'6" interspaces. Trials are to be established to ascertain the position with modern cane varieties, and the results of this work may form a valuable contribution to the overall harvesting problem.

Another research which is proceeding at the present time is an assessment of the increased deterioration, if any, which results from cutting cane into short lengths during the harvesting



Average Crushing Rate—Queensland mills (excluding C.S.R. mills and Rocky Point): Pioneer and Inkerman excluded 1944. Mt. Bauple ceased operation after 1950.

operation. One harvester, being tested and demonstrated in the industry, cuts the cane into short pieces; its performance is so promising that the study of deterioration on both cut-up and whole stalks was undertaken to answer that question.

Yield Decline

The hypothesis that ratoon stunting disease was a major factor in varietal yield decline was first enunciated by this Bureau. During the subsequent campaign to clean up the disease by hot water treatment very numerous yield trials comparing diseased with healthy planting material have been conducted. Although considerable

crop losses have been measured by this means in the diseased plots of certain varieties it has been found and confirmed that the varieties Badila, Q.50 and C.P.29/116 show less improvement after hot water treatment. When this information is considered side by side with the fact that Badila has, over a period of half a century, persisted as a major variety, and that Q.50 and C.P.29/116 show no sign of decline in yield, the original hypothesis receives a considerable amount of support. It is more than likely that the large number of commercial canes, which have declined in vigour throughout the world over a period of decades, were varieties susceptible to this disease. Conversely those like

Badila, which survived for long periods, were very likely the more resistant types.

Old and New Varieties

With the means at hand to cure ratoon stunting disease and to start afresh with clean stocks, the opportunity presented itself to make comparative tests of old favourites and modern varieties under the same set of conditions. Such by-gone canes in South Queensland as M.1900, D.1135, M.189, P.O.J.2878, Co.281, Co.290 and P.O.J.2714 were used against modern canes, but in all cases the newer varieties have proved superior. It is an interesting result, since the trials record for the first time comparative yields unaffected by seasonal variation, changing fertilizer usage or disease.

Prosecutions

During the year the Bureau initiated two prosecutions against growers for breaches of the Acts in relation to diseased cane. Many years have elapsed since the last prosecution was launched and recourse is not made to this legislative power except in unusual circumstances. In the more important of these two cases the grower was prosecuted for planting, after several warnings, cane affected with ratoon stunting disease. In the other case a grower was proceeded against for introducing plants of a cane variety across a quarantine boundary, the plants having been transferred from a district where leaf scald and chlorotic streak exist to one where neither disease has ever occurred.

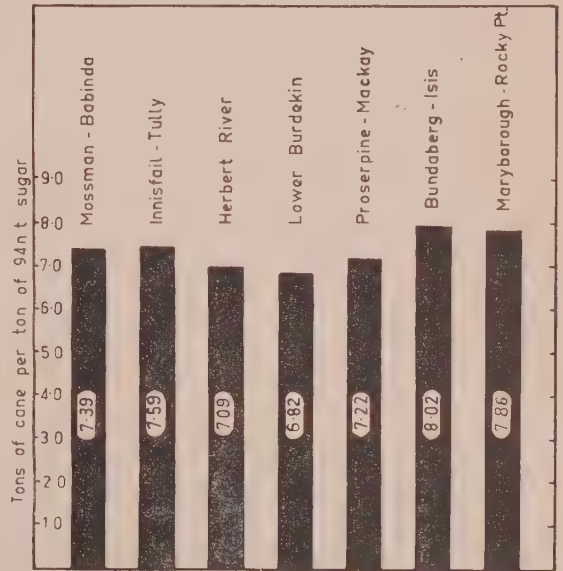
Bacterial Mottle Disease

Progressive studies of this disease have disclosed two items of particular interest. The presence of the disease in several grasses—in one case a considerable distance upstream from any sugar cane—suggests that the disease occurs independently of the sugar cane plant and that its eradication is not merely a matter of cleaning up all sugar cane in the affected areas. The second disclosure is the variable reaction of cane varieties to the disease; this holds out hope of providing resistant types for the flooded areas on which bacterial mottle occurs. It appears likely that this disease did not previously assert itself—although known for many years on

the Herbert River—because of the relative resistance of the varieties then being grown.

The Popularity of Urea

Although relatively a newcomer to the sugar industry the results of Bureau field trials have been so successful, and the publicity given to its advantages so effective, that demand outstripped supply in several areas last year. Growers who



Sugar ratio averages for 10 years 1948-1957 indicate in which districts the sweetest cane is grown.

used the material in the early stages were enthusiastic regarding its storing qualities and the ease with which it fed uniformly through their fertilizer distributors. These advantages were in addition to the lower unit cost and the saving in freight and distribution. The aerial application trials with urea also attracted much attention but it is not yet clear whether this form of usage will extend in our small farm industry. There is a growing interest in more concentrated forms of fertilizers, partly because of the long distances between source of supply and points of usage, and the possibility of reducing costs with more modern concentrates.

Giant Sensitive Plant

The 1957-58 year witnessed the first wide-scale attempt to effect some control of this dangerous plant pest. A resident officer of the Co-ordinating Board, stationed at Innisfail, has conducted ex-

tensive spraying with a view to preventing flowering and seeding of the plant throughout the local area. Simultaneously an attempt was made to prevent the removal of sand and gravel from the known seed-bed areas on Liverpool Creek, thus reducing the spread of the pest throughout the district. In addition the Government, following a request from the Queensland Cane Growers' Council, agreed to the appointment of a senior Bureau officer to the Noxious Weeds Committee of the Co-ordinating Board. Some effective assistance to the overall campaign was also afforded by an amendment to the Sugar Experiment Stations Acts which empowered Cane Pest and Disease Control Boards to expend funds on giant sensitive plant eradication on assigned lands. Simultaneously there was a tightening of control over imported Centro seed—in which giant sensitive plant seed occurs as an adulterant—and all such imports now have to be cleaned. However, the problem remains a serious one and

the campaign of eradication will be a long and costly one.

Bureau's Administrative Building

In January, 1958, a start was made on the new Brisbane headquarters for the Bureau; it is expected to be ready for occupation by November of this year. The site on Gregory Terrace, on the edge of the city, is an ideal one, and the building is designed on modern lines with adequate space for present staff and foreseeable expansion. Considerable thought was given to laboratory layouts and, even though the structure will be air-conditioned throughout, there will be a special constant temperature room for sugar analytical work and metrology. The building, in its fully completed form, should be worthy of the £62 million industry for which the Bureau is the official research body.

Re-building at Bundaberg Station

In the latter part of 1957 fire destroyed a



A good, standing crop of Q.66 on the Abergowrie flats.

composite building on Bundaberg Sugar Experiment Station, and this was replaced by a larger structure within a few months. The new brick building contains the juice analysis laboratory, a mill technology work-shop, several garages and the small crushing-mill annex.

Mackay Mosaic Campaign

Following the clean-up of mosaic disease in the Lower Burdekin and the reduction of its incidence in Nambour and Bundaberg to very low proportions, attention has been focussed on reducing the large amount of mosaic disease in certain parts of the Mackay area. Within one year the campaign has been eminently successful. The basic plan was to prevent, as far as possible, the use of diseased plants, and this was achieved by arranging with each grower on a diseased farm to define the small area from which his planting material would be taken in the next planting season. Such defined areas were then intensively and regularly inspected and rogued. Evidence has been forthcoming during this campaign that the spread of infection from grassy headlands and roadsides is not so serious as considered previously and that spread of the disease is, in the main, from diseased to healthy stools within the cane fields. There are very good reasons why this campaign should be persisted with even though the crop losses caused by mosaic disease are not serious in the varieties being grown at present. Some of the newer seedling canes are much more susceptible to mosaic than is Q.50, and the persistence of a heavily diseased condition in that area will debar the introduction of more susceptible types which may be of greater economic value.

More Extensive Varietal Testing

Queensland's long-drawn-out sugar industry—extending for over 1,000 miles north to south—covers a wide range of latitude, rainfall and temperature. A quarter century ago there was ample evidence of specialised environmental requirements of cane varieties. Those suited to the far north were useless in the south and *vice versa*, and the canes grown in the irrigated Lower Burdekin were of a different class to the favoured types of Mackay. Extensive hybridization and more refined selection procedures would appear

to have overcome these climatic barriers and to-day Q.50, N.Co.310, Q.58, Pindar, etc. are being grown successfully in a range of climates in successful competition with the other varieties of each area. Some emphasis is therefore being placed on an all-round exchange of selected seedling canes. Each district receives canes from all other areas in the fairly early stages of selection, and a more particular emphasis is being laid on high-sugar types. Q.58, selected for Mackay conditions—and already eminently successful there—is performing very well at Ingham and Meringa in the north and at Bundaberg and Nambour in the south. Q.63, an even higher-sugar type, is being tested in all districts. With a target composed of higher field efficiency and lower costs, the principal means of reaching it are greater yields of standing cane (the anti-lodging programme) and higher sugar content with smaller crops—but with more sugar per acre. Both factors are of prime importance in increasing net returns per unit area.

Industry Stability Improved

Production statistics leave little room for doubt that, in the last decade or so, the stability of the industry has entered a new phase. The serious fluctuations one time experienced were due to bad grub and wireworm years in the north and central areas respectively, to the losses caused by gumming, Fiji and downy mildew diseases, to cyclones in the north, to droughts in the central and southern areas, to frosts in the south and to the disastrous effects of droughts and frosts on the range of varieties then being grown.

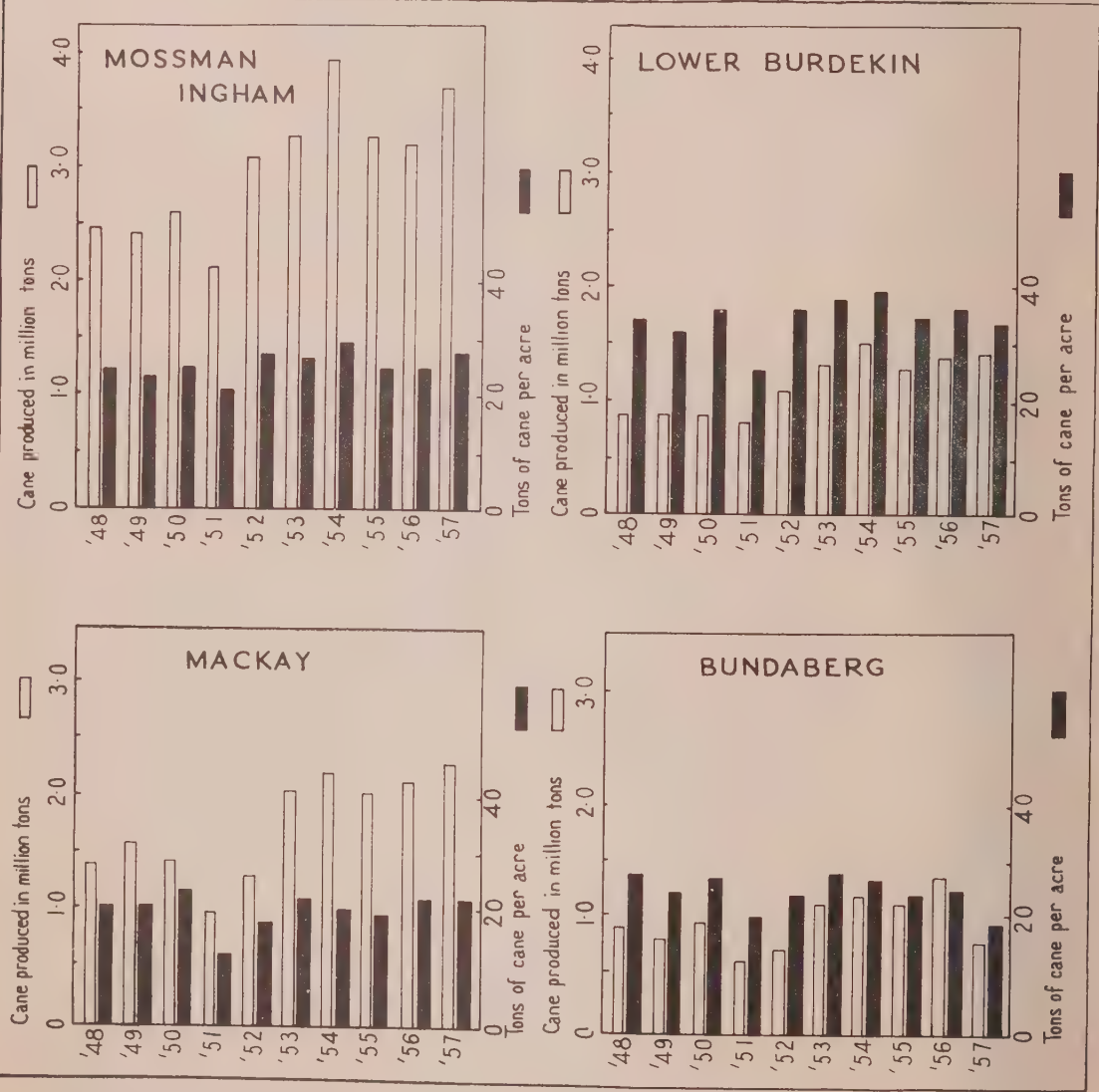
To-day we can assert with confidence that, irrespective of seasonal influences, the State-wide production is more uniform because of the technical advances made in recent times. Cane grub losses need no longer be considered as a production factor, wireworms do not now affect germination and ultimate crop development, the three major diseases are virtually extinct, and the modern canes being grown have raised the standard of drought and frost resistance to a new, high level. The crop produced in 1957 in the disastrous South Queensland drought has only to be compared with those produced in 1932 and 1946 to illustrate this point. The industry has entered a new era of stability and

this should simplify the solution of industry problems associated with over-production, as well as make less uncertain any forward planning.

Ratoon Stunting Disease

A development which has attracted some interest during the year is the treatment of whole stalks in hot water as distinct from the established method of treatment of cut-up plants. There are obvious advantages in this form of handling since it fits in with the universally used cutter-

planter. However it is a development which will need careful watching. The baskets or bags of cut-up plants allow ready circulation of the hot water between the cuttings and ensure that all cuttings reach the desired temperature. Compact slings of stalks in which the individual stalks are closely packed will not allow effective circulation unless the slings are loosened and the canes left free with sufficient water space between them. Much of the difficulty associated with the hot-air treatment of full stalks in Louisiana was due



Total cane production and tons per acre in the four major districts during the past ten years.

to inadequate air space between the stalks. Supervisors of Cane Pest and Disease Control Boards who are associated with this work should satisfy themselves that the temperature within the bundles of stalks is comparable with that measured within a basket of cut-up cane.

Sunshine and Sugar

The investigation into the low sugar content of Babinda district cane is proceeding along three lines. The nutritional aspects of the crop are being examined in detail by means of field trials and foliar diagnosis; the two sunshine recorders are being used to collect day by day data in comparison with similar recordings at Meringa ; and the seedling sub-station at Bartle Frere, plus the introduction of a range of high testing canes from other areas, is being used as a quick means of obtaining high c.c.s. varieties for the district. The higher than average sunlight hours in the early months of this year were the basis of a prediction that Babinda c.c.s. would be higher than in recent years and this prediction has been confirmed. However, the position is not as clear cut as could be desired because of the complicating factor of a change in the proportion of Q.57 being grown.

Bagasse Hardboard

The Bureau co-operated with Monsanto Chemical Co. of Brisbane in a project to prepare

a hardboard from bagasse by a dry process. Bagasse, air-dried to approximately 10 per cent. moisture content, was disintegrated to break up the larger particles, and boards were prepared containing varying proportions of coarse and fine material and resin. The project also included varying moisture content and varying pressing temperatures.

The specimen boards are being submitted progressively to the University of Queensland for the specific tests on which the characteristics of hardboards are based and, to date, the results are very favourable. The Bureau's interest in this research is based firstly on a desire to find an economic outlet for the bagasse surplus which is costly to dispose of and for which there is no commercial use and, secondly, to point the way to a commercial development which requires no large water supplies and has no effluent problem. It is hoped that, when the final results of the investigation are presented to the industry, the development will be an industry-controlled one.

Yours faithfully,

A handwritten signature in dark ink, appearing to read "Norman King". The signature is fluid and cursive, with a large initial "N" and a long, sweeping underline.

Director.

Appendix I

C.C.S. Formula

$$\text{C.c.s. in cane} = \text{Pol in cane} - \frac{\text{Soluble impurities in cane}}{2}$$

In practice, per cent. C.c.s. is calculated by the empirical formula —

$$\text{C.c.s.} = \frac{3P}{2} \left(1 - \frac{5+F}{100} \right) - \frac{B}{2} \left(1 - \frac{3+F}{100} \right)$$

where —

P = pol per cent. first expressed juice.

B = brix per cent. first expressed juice.

F = fibre per cent. cane.

Sugar Values, 1957 Season

The final prices for the 1957 season's sugar have been declared as follows:—

	No. 1 Pool			No. 2 Pool		Total
	Home Consumption	Surplus	Total	Excess	Unassigned	
Tons	515,356	608,644	1,124,000	131,862	50	1,255,912
Per cent.	45.8502	54.1498	* 100	..	..	..
Price	£54 3 0	£46 4 6	£49 17 2	£44 1 0	10/-	£49 5 0

In addition the value for New South Wales production was:—

	Home Consumption	Surplus	Total
Tons	34,894	1,946	36,840
Per cent.	94.7164	5.2836	100
Price	£54 3 0	£46 4 6	£53 14 7

Table A

Summary of production and consumption figures and sugar values for ten years

Year	Total Sugar Production at 94 n.t.*	Total Sugar Exported at 94 n.t.	Average Australian Price	Average Export Price	Average Price No. 1 Pool Sugar	Average Price all Sugar	Total Value
			£ s. d.	£ s. d.	£ s. d.	£ s. d.	£
1948	909,896	440,814	23 1 0	28 2 0	24 17 0	25 9 11	23,198,000
1949	896,236	431,254	24 6 0	29 7 6	26 9 3	26 14 10	23,967,000
1950	879,689	395,151	24 11 0	32 16 6	28 4 1	28 5 4	24,866,000
1951	704,043	154,486	33 14 0	36 15 6	34 7 4	34 7 6	24,201,478
1952	934,226	471,008	44 3 0	41 2 0	42 14 2	42 12 3	39,809,705
1953	1,220,025	730,566	47 18 6	39 18 0	43 8 3	42 7 11	51,723,936
1954	1,300,844	784,451	47 1 0	37 8 0	42 9 11	41 4 7	53,632,714
1955	1,135,331	624,521	46 18 0	38 11 6	42 14 2	42 6 5	48,048,154
1956	1,171,509	673,742	53 11 6	41 6 5	47 1 9	46 10 6	54,504,456
1957	1,255,912	740,556	54 3 0	45 16 8	49 17 2	49 5 0	61,853,666

* Excluding Local Sales.

Table I
Sugar Cane Harvested, 1957 — Estimated, 1958

Domestic Tonnages	Actual Tonnages		Mills	Estimated, 1958 (May estimate)
	Accepted	Condemned		
244,915	244,915	40	Mossman	262,000
330,689	330,689	41	Hambledon	370,000
355,807	355,807	207	Mulgrave	378,345
325,415	325,415	..	Babinda	340,000
276,757	276,757	4	Goondi	280,000
263,069	263,069	..	Mourilyan	254,000
395,917	395,917	..	South Johnstone	380,000
394,426	394,426	52	Tully	390,000
696,186	704,173	86	Victoria	730,000
408,111	408,111	..	Macknade	400,000
3,691,292	3,699,279	430		3,784,345
236,750	228,763	93	Invicta	190,000
373,763	373,763	112	Pioneer	420,570
379,823	379,823	476	Kalamia	407,000
399,776	399,776	38	Inkerman	507,000
1,390,112	1,382,125	719		1,524,570
408,323	408,323	51	Proserpine	400,000
369,182	369,160	25	Farleigh	400,000
419,671	419,643	46	Racecourse	460,000
390,466	390,533	..	Pleystowe	380,000
348,131	348,161	..	Marian	380,000
181,281	181,234	112	Cattle Creek	175,000
222,793	222,793	15	North Eton	260,000
362,213	362,213	28	Plane Creek	420,000
2,702,060	2,702,060	277		2,875,000
182,120	182,120	..	Fairymead	345,000
90,758	95,672	2	Qunaba	150,000
223,355	218,475	17	Millaquin	350,000
189,392	189,730	30	Bingera	300,000
32,267	31,875	11	Gin Gin	65,000
215,695	215,801	4	Isis	230,000
50,872	50,786	..	Maryborough	145,000
147,717	147,717	..	Moreton	152,650
29,977	29,977	..	Rocky Point	45,000
1,162,153	1,162,153	64		1,782,650
8,945,617	8,945,617	1,490		9,966,565

Table II
Sugar Production (94 Net Titre), 1952-1957

Districts	1952	1953	1954	1955	1956	1957
North of Townsville	421,921	467,716	502,276	413,853	406,172	516,345
South of Townsville	512,693	752,667	789,969	721,822	765,698	739,926
Totals*	934,614	1,220,383	1,301,245	1,135,675	1,171,870	1,256,271

* Local Sales included.

Table III
Classes of Cane Harvested, 1957

Districts	Plant Cane		Ratoons		Standover		Total Acres
	Acres	%	Acres	%	Acres	%	
Northern	43,028	32.0	91,186	67.8	289	0.2	134,503
Burdekin	20,421	48.9	20,875	49.9	491	1.2	41,787
Mackay	46,807	37.2	76,112	60.4	3,042	2.4	125,961
Southern	15,601	24.8	41,380	66.0	5,753	9.2	62,734
Whole State ..	125,857	34.5	229,553	62.9	9,575	2.6	364,985

Table IV
Total and Average Yields by Districts, 1957

Districts	Tons of Cane	Tons Cane per Acre	Tons 94 N.T. Sugar per Acre
Mossman-Ingham	3,691,292	27.44	3.83
Lower Burdekin	1,390,112	33.27	5.01
Proserpine	408,323	21.64	3.04
Mackay	2,293,737	21.42	3.00
Bundaberg-Gin Gin	717,892	18.49	2.43
Childers-Maryborough	266,567	17.07	2.23
Nambour-Beenleigh	177,694	21.42	2.87
Whole State	8,945,617	24.51	3.44

Table V
Acres Cultivated and Harvested, Yields of Cane and Sugar, Acre Yields and Quality of Cane, 1948-1957

Year	Acres* Cultivated	Acres Harvested for Milling	Total Yields		Yields per Acre		Tons Cane per ton Sugar
			Cane	Sugar †	Cane	Sugar	
1948	384,213	258,585	6,433,556	910,049	24.88	3.52	7.07
1949	395,660	275,313	6,518,021	897,267	23.67	3.26	7.26
1950	381,545	257,562	6,691,706	879,844	25.98	3.42	7.61
1951	388,348	273,371	5,005,172	704,342	18.31	2.58	7.11
1952	419,834	274,757	6,841,536	934,614	24.90	3.40	7.32
1953	466,484	332,703	8,751,063	1,220,383	26.30	3.67	7.17
1954	486,741	367,640	9,864,305	1,301,245	26.83	3.54	7.58
1955	482,145	365,252	8,616,163	1,135,675	23.59	3.11	7.59
1956	480,116	360,932	8,978,081	1,171,870	24.87	3.25	7.66
1957	..	364,985	8,945,617	1,256,271	24.51	3.44	7.12
Averages ..	..	313,110	7,664,522	1,041,156	24.48	3.33	7.36

* Supplied by Government Statistician.

† Includes Local Sales.

Table VI
*** Details of Molasses Disposals for Periods 1948-1957**

Usage	Tons of Molasses									
	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957
Distilleries	119,615	115,376	99,940	79,063	99,410	154,152	153,212	151,349	159,733	128,487
Fertilizer	34,655	49,293	36,446	34,529	47,260	75,781	69,446	70,691	60,841	68,001
Stock Feed	38,349	36,479	36,621	37,151	37,099	36,263	38,046	35,127	36,699	30,385
Mill Fuel	11,003	9,771	15,556	6,327	5,882	1,211	7,140	10,095	9,315	1,774
Ferment	2,479	3,561	3,582	2,033	2,532	3,196	2,779	2,727	2,871	2,411
Other Purposes	161	1,204	231	9	151	217	352	1,179	595	762
Wasted	1,099	1,858	325	235	482	1,111	1,544	1,232	341	1,778
Totals	207,361	217,542	192,701	159,347	192,816	271,931	272,519	272,400	270,395	233,598

* Supplied by Government Statistician.

Table B
Table of Mill Peaks (Tons of 94 n.t. Suğar)

Mill	1929	1939	1949†	1950†	1952	1953	1954	1957	1958
Mossman	14,972	20,000	22,000	22,000	24,000	31,000	31,000	31,000	31,000
Hambledon .. .	31,836	36,000	39,600	39,600	41,000	44,000	44,000	47,500	47,500
Mulgrave	31,643	36,000	40,100	40,100	40,500	47,500	47,500	47,500	47,500
Babinda	31,901	36,000	39,600	39,600	42,500	46,000	46,400	46,400	46,400
Goondi	27,034	29,500	32,400	32,400	34,500	38,000	38,000	38,000	38,000
Mourilyan .. .	23,630	27,000	29,700	29,700	31,000	34,000	34,000	34,000	34,000
South Johnstone ..	30,979	36,000	39,600	39,600	42,500	47,000	47,000	49,000	49,000
Tully	30,930	38,000	42,100	42,100	45,000	47,000	47,000	50,000	50,000
Victoria	32,221	37,500	43,600	49,100	52,000	78,000	82,000	84,000	*90,000
Macknade	30,952	34,000	39,900	46,500	48,500	52,000	52,000	52,000	52,000
Invicta	11,736	16,000	18,300	19,100	20,500	30,000	30,000	30,000	|| 27,000
Pioneer	21,391	26,000	30,100	34,000	35,500	45,000	45,000	47,000	47,000
Kalamia	26,053	31,000	35,400	35,600	38,000	48,000	48,000	49,000	49,000
Inkerman	*24,207	31,000	36,800	42,000	45,000	55,000	55,000	57,500	57,500
Proserpine	16,650	23,000	26,300	33,000	35,000	43,000	43,000	45,000	45,000
Farleigh	16,993	23,000	27,600	32,400	33,500	42,000	42,000	44,000	44,000
Racecourse .. .	18,066	24,000	29,000	35,200	36,500	42,000	42,000	44,000	44,000
Pleystowe	19,871	24,000	29,200	35,900	37,000	45,000	45,000	45,000	45,000
Marian	18,997	24,000	28,600	32,300	33,500	42,000	42,000	42,000	42,000
Cattle Creek .. .	8,791	12,000	13,400	14,100	14,500	20,000	20,000	21,000	21,000
North Eton .. .	9,319	12,000	14,500	15,900	17,500	26,000	26,000	26,000	26,000
Plane Creek .. .	18,233	24,000	28,600	30,800	32,500	42,000	42,000	44,000	44,000
Fairymead .. .	15,882	21,000	25,700	28,600	29,500	37,000	37,500	37,500	37,500
Qunaba	8,940	10,000	11,200	12,700	13,500	15,500	\$16,500	19,500	19,500
Millaquin	14,443	19,000	24,100	29,600	31,000	35,000	\$39,000	37,000	37,000
Bingera	17,864	23,000	27,800	31,000	31,500	37,000	37,000	39,000	39,000
Gin Gin	6,000	6,500	8,000	8,400	9,000	12,500	13,000	14,500	14,500
Isis	28,011	27,000	30,000	30,200	31,500	33,000	35,000	37,500	37,500
Maryborough .. .	3,862	7,500	9,500	9,500	†17,300	14,500	20,000	20,000	20,000
Mount Bauple .. .	6,231	6,500	7,200	7,200	..	..	..	..	..
Moreton	11,586	14,000	16,000	16,000	16,500	20,000	20,000	20,000	20,000
Eagleby	280	300	..	..	..	..	..	..	..
Rooky Point .. .	2,014	2,200	2,700	2,700	2,780	3,500	4,000	5,000	5,500
	611,428	737,000	848,600	916,900	963,080	1,152,500	1,170,900	1,203,900	1,207,400

* Increased by 2,500 tons in 1938.

† Does not include 3 per cent. for Soldiers' Settlement.

‡ Includes 4,800 tons for Mt. Bauple.

§ As from 1955 season 2,000 tons peak was transferred from Millaquin to Qunaba.

** Peak of 6,000 tons 94 n.t. sugar transferred from Invicta.

|| Balance of Invicta peak increased by 3,000 tons.



Bureau agronomist using an electric soil moisture meter on a Burdekin farm.

Division of Soils and Agronomy

L. G. Vallance, Assistant Director.

FERTILIZER TRIALS

Sulphate of Ammonia and Green Manures

Inter-cycle cropping with green manures is a widely established practice in all districts. That it is a beneficial practice in the majority of cases, is without doubt. Of recent years however, there has been some uncertainty regarding the desirability of applying a nitrogen top-dressing to plant cane following the ploughing under of a good green manure crop prior to planting. In the past, field experimentation and observation have indicated that little benefit was obtained since the legume nitrogen was apparently sufficient to supply the requirements of the plant crop. The possibility exists that the present almost universal use of vigorous hybrid varieties may have altered conditions in this respect.

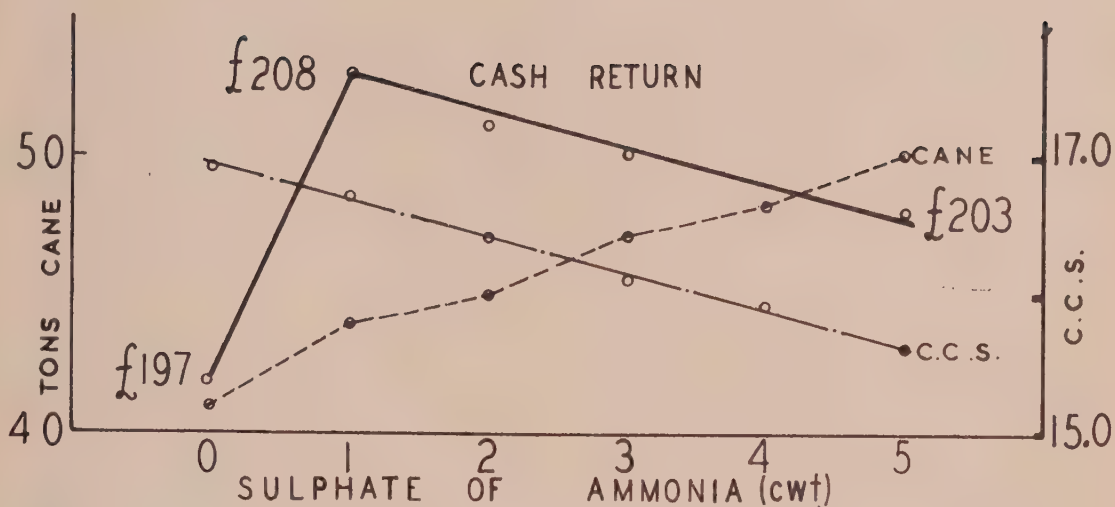
To check on this a series of trials was begun

during the year, bearing in mind that it was unlikely that any finality would be reached in a single season. These first trials were set out in all major districts and to date harvest figures are available from the Cairns, Innisfail, Ingham, Lower Burdekin and Bundaberg areas. The treatments were nil, 1 cwt., 2 cwt., 3 cwt., 4 cwt., and 5 cwt. of sulphate of ammonia. On each field a good crop of either velvet bean or poona pea had been turned in two to three months before planting.

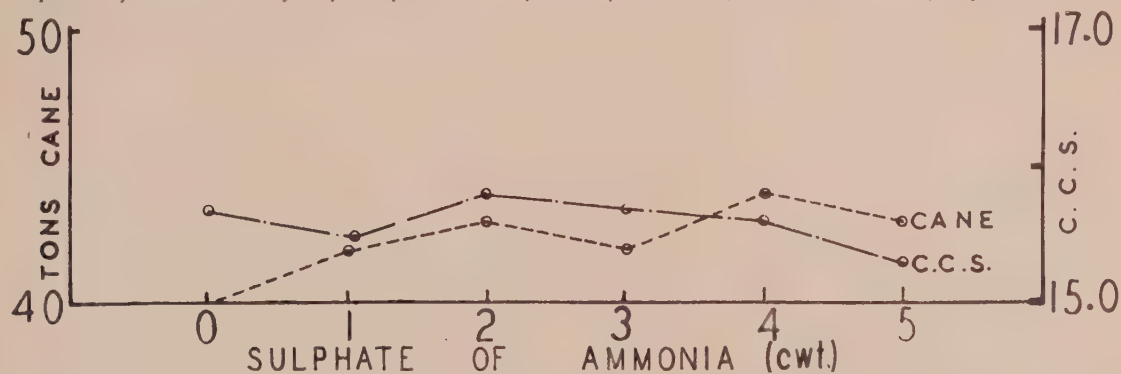
In four of the seven harvested trials the sulphate of ammonia applications significantly increased the yield of cane. In the other three the differences due to treatment were not significant, although an increase of about one ton of cane due to the first cwt. of fertilizer was fairly well defined. The reason why there should be a definite response in some cases and not in others was not obvious.

Effect on c.c.s.

However, a most interesting point in these



Sulphate of ammonia very definitely increased yields of cane and, at the same time, depressed C.C.S.



In contrast to the previous illustration these cane yields did not show any well-defined increase due to sulphate of ammonia, nor was there any corresponding marked depression of C.C.S.

trials was the effect of added nitrogen on c.c.s. in relation to its effect on cane growth. In those trials in which nitrogen definitely increased the tonnage of cane there was a distinct depressing effect on c.c.s. Whereas where no significant growth increase occurred, no marked effect on sugar was noticeable. This is clearly shown in the two graphs. The straight-line drop in c.c.s. from 16.9 to 15.6 in the first graph is in sharp contrast to the rise in cane tonnage from 41 to 50 tons. On the other hand, the second graph shows that in those trials where the tendency for nitrogen to increase tonnages was slight and not very well marked the effect on c.c.s. was similarly somewhat vague.

The depression of c.c.s. by nitrogen application

is important economically, and an indication of its magnitude in this respect is also shown,

Nitrogen-phosphoric acid-potash trials

Four of these routine factorial fertilizer trials, which are set out to keep a check on the fertilizer requirements of various soil types, were harvested during the year. The soils were (1) a red basaltic loam at Cairns (second ratoon crop), (2) a grey forest loam at Ingham (first ratoon crop), (3) a red sandy loam at Bundaberg (plant cane) and (4) a heavy alluvial loam in the Maroochy River area (first ratoon crop). In each case there was a significant response in tonnage due to nitrogen, but none showed any increase due to the application of superphosphate. Only one trial (Maroochy R.) showed an increased yield due to

potash. The effect of these three fertilizers on c.c.s. was variable, but there was a general trend towards depression with increased applications.

Other Trials

The series of trials to compare sulphate of ammonia and urea was completed by the harvest of three ratoon crops in the Burdekin and Mackay districts. As was reported last year both urea and sulphate of ammonia seem equally suited for top dressing sugar cane. A good response to nitrogen was obtained in each trial and no significant difference between the two fertilizers was observed. The progress of the rock phosphate trial at Mackay and the potash-trash trial at Bundaberg is referred to in the sections dealing with the activities of these two experiment stations.

NUTRITION INVESTIGATIONS WITH POTASH

Soil analytical work during the past ten years has shown a pronounced tendency towards the depletion of potash in the soils of many districts. A series of experiments was designed to investigate the influence of (a) soil potash and (b) potash applied as fertilizer, on the uptake of this element by the cane plant. To date eight randomised trials are in progress in various districts, each using the following levels of muriate of potash per acre:—nil, 60, 120, 180, 240 and 300 lb. A considerable amount of analytical work was required in the selection of suitable sites since it was necessary to obtain uniform areas with a known content of available potash.

The analysis of leaf samples from each plot has shown to date that only a slight increase in leaf potash has occurred with increasing potash applications. Moreover, there was little or no relationship between leaf potash and the replaceable potash content of the soil at planting. The leaf analyses have, as yet, been carried out at two periods only, i.e., at three and five months after planting. The whole of the third leaf was used for the analysis.

On these plots the variation in replaceable potash in the soil during the season is also being

studied. The results are incomplete at present but there appears to have been a build up of potash in the soil during the dry spring of 1957, followed by a rapid removal during the heavy, late, summer rainfall and boom growing period.

These trials will be harvested towards the end of 1958 and ratooned for further study.

SOIL MOISTURE WORK

Irrigation Trial

On the Lower Burdekin station Trojan was planted in autumn, 1957, in a block which was randomized into 32 plots. Half of these were watered whenever the soil dried out to wilting point while the other 16 plots were allowed to dry to "one-third available moisture" before the cane was irrigated. In effect there were two irrigation treatments and the former is referred to as the "dry" and the latter as the "wet" treatment.

Measurements of soil moisture content were made gravimetrically from samples obtained from the top nine inches of soil. About 1,700 samples were collected for moisture determination. Resistance measurements were also made with electrodes embedded in plaster of paris blocks buried at various depths in the plots. This was done in order to ascertain the reliability of the method for use in any future irrigation investigations.

The trial is not yet harvested but the following information is available from the progress reports and observations.

Rainfall and Irrigation

Except for a fall of 112 points at the end of October, the rain received on the plots from planting to late January was negligible. December and January were particularly hot and dry, with temperatures reaching to 105°F. It was necessary to water the "wet" plots five weeks after planting, and three weeks later the "dry" series had reached wilting point and also required irrigating. In all, the former received five irrigations before the onset of the wet season at the end of January, and the latter received three. During this period the "dry" plots had neither the vigour nor the stooling of the "wet" ones. The latter were

also much greener and this colour difference was retained well into the wet season.

February, March and April rainfall was sufficient to keep the moisture content of the whole area above the "one-third available moisture" level, throughout this period. At the end of this time the crop was commencing to lodge in places and this was especially so in the "wet" plots.

The differences noted in the two treatments prior to the wet season were still noticeable after the rains, but less marked. Although yield data is not yet available, the greater tonnages of the "wet" plots appears to be due to better stooling rather than to differences in stalk length. This seems to indicate that adequate water should be provided when the young cane is stooling out and that failure to do so cannot be compensated for at a later date.

Resistance Readings and Moisture Contents

Throughout the trial resistance readings from eight plots with three plaster of paris blocks per plot were recorded and compared with moisture contents determined gravimetrically. Reasonable agreement between the two methods was obtained, and in view of the considerable saving in time and labour the future use of these blocks in similar experiments seems warranted.

Moisture Losses at Greater Depths

Plaster blocks were also installed at depths ranging to nearly six feet and it was shown that no moisture was withdrawn below a depth of 33 inches. At this depth a very sandy subsoil occurred. Blocks installed at depths of 15 and 21 inches repeatedly indicated that moisture was being removed, but this was always at a slower rate than that recorded for the nine inch depth. Generally, all major movements of moisture at



Filter mud being spread on a farm in the North Eton area.

greater depths lagged behind those observed in the higher levels, and they did not show the same amount of fluctuation.

POOR GROWTH AND POOR RATOONING STUDIES

Nematodes as a Contributing Factor

This work has been in progress in the Bundaberg and Mackay districts for two or three years but it has received a fresh impetus from the early investigations into the possibility of nematodes being a contributing factor. Several genera of parasitic nematodes have been found in very large numbers in association with some of the poor growth and poor ratooning areas in a number of varieties of cane. The nematodes found

consist mainly of free living forms although the root knot nematode (*Meloidogyne* sp) also occurs in some fields.

Consequently, several fumigation trials have already been set out, and many more are planned for infected fields at Bundaberg, Mackay and the Lower Burdekin. Tractor-drawn injection equipment has been used with all available nematicides (including nemagon). The results of these trials should indicate whether the nematodes are responsible for the poor growth and to what extent they have depressed yields.

CANE DETERIORATION TRIALS

Babinda Deterioration Tests

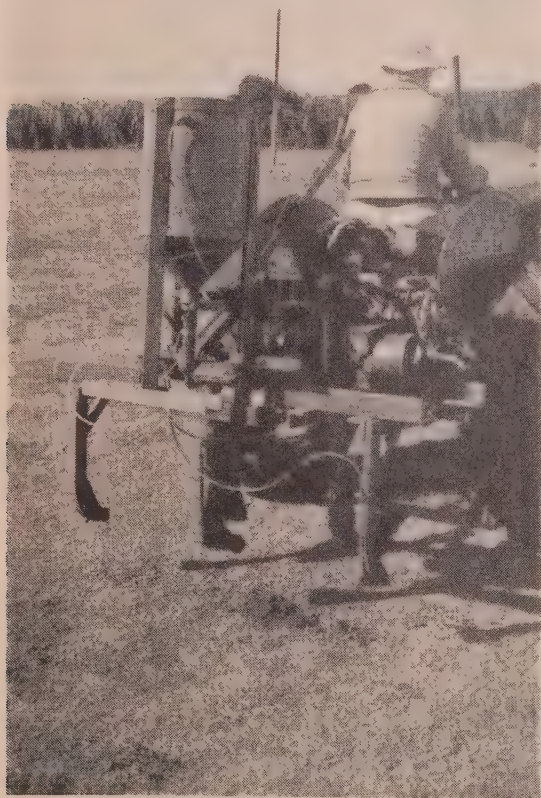
Tests were conducted during June, July, September and October in the Babinda district. Cane of three varieties, Pindar, Badila and Q.57 was collected from approximately the same area in the district and stored at the one location. Weight, c.c.s. and sucrose were determined at 0, 2 and 4 days after cutting. Cane for each test was freshly burned.

The primary object of the trial was to determine whether any appreciable differences occurred in the rate of deterioration after harvest of these three important varieties. The results showed that actual loss of sugar was much the same in all three canes up to four days after cutting. Q.57 produced somewhat better figures than the other two and it seems possible that this variety might possess a greater resistance to deterioration. However, the figures were not sufficiently definite to be significant.

Deterioration Trials on Meringa Station

Six varieties were tested—Q.44, G.362, Q.50, Trojan, P.O.J.2878 and Vidar. Samples were taken at 0, 4, 8 and 12 days after cutting and the tests were performed at three times during the season. The objects were to determine (a) whether the character of resistance was constant; (b) whether there was a correlation between deterioration at 4, 8 and 12 days; and (c) to test the six varieties for resistance to deterioration.

From the results obtained Q.44 and P.O.J. 2878 appeared to be more resistant to deterioration than the others. However, the range of variation



Injection equipment, for soil fumigation against nematodes, mounted on a farm tractor and grubber.

within the varieties was not very great and it seems that no very susceptible variety was among those selected for the test.

There was a correlation between deterioration at 12 days and four days but it was not very close and it would not be possible to attempt to use this as a measure of the deterioration at four days. There also appeared to be an interaction between the varieties and time of the season the test was carried out, e.g., Q.44 was the most resistant in the June and August tests but was the most susceptible in the October test.

The last test of these six varieties was extended to include cane left standing in the field after it was burnt. It was not possible to make weight measurements of the standing cane so comparison was made using purity only.

In practically all cases the purity drop was greater in the cut cane than in that left standing, indicating that more inversion took place in the former than in the latter.

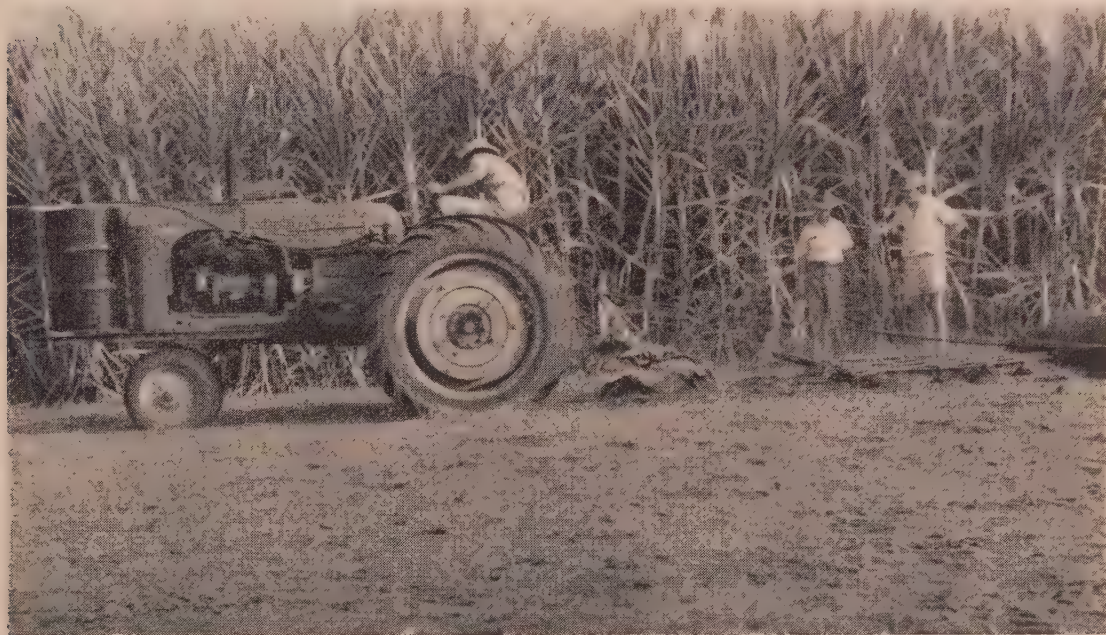
A comparison was also made between two methods of storage to determine the effect on deterioration. Cane of three varieties was stored under wet bags. Purities of the juice indicated

that there was no difference in the amount of inversion between cane stored under bags and cane stored in the open.

REFRACTOMETER BRIX FOR VARIETAL SELECTION WORK

Three Point Stab—v—Two-third Stab

Previous work in determining juice quality for seedling selection had indicated that for tops and butts a single point stab into the stalk was not as good as a three point stab; juice obtained in the latter gave a closer correlation with the spindle brix of juice from the crushed stalk. The reason for this state of affairs is probably that no one point is representative of the top or the butt portions of the stalk for all canes. Not only does this apply to the top and butt sections, but probably also to whole stalk sampling. Two trials were made in order to compare a three point stab ($\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ positions on the stalk) with the usual method in which a stab is made at a point two-thirds up the stalk. Samples from twenty-one plots in a replicated yield observation trial were brixed by the two methods. Scatter



Another injector arrangement. Here the grubber and injector are followed by diamond harrows and roller to seal the soil surface.



A method of testing the rate of deterioration of 2,4-D in a range of soil types.

diagrams plotting brix against c.c.s. indicated that the three point stab was more closely correlated with c.c.s. than the single two-thirds point.

A similar test was carried out later in the season. Here the same time was spent obtaining the three point brix as the two-thirds one, and scatter diagrams again showed a closer correlation with c.c.s. for the three point stab than the two-third stab.

Brix as a Substitute for c.c.s. in Seedling Selection

A statistical analysis of the data from these trials has shown that, if the three point brix method is used instead of c.c.s. for determining seedling quality the efficiency of selection is about 93 per cent. of that which would have been obtained if c.c.s. had been used. If the single stab method were used it would drop to about 84 per cent. thus showing the superiority of the three point stab method. Both trials gave similar results with regard to estimates of efficiency, and if this is so it would appear that brix measure-

ments could substitute for c.c.s. without undue loss of accuracy in the early stages of seedling selection.

GERMINATION AFTER HOT WATER TREATMENT

Several germination trials on hot water treated setts were conducted between September and November. These were undertaken with a view to providing some basis for selection of plants for heat treatment, and to evaluate some cooling treatments which have come into operation.

Position of Sett on Stalk

This trial was carried out at two periods. In September, stalks were divided into four parts and one sett from each was planted. In November, top setts and butt setts were used.

The results clearly indicated that not only were there more shoots obtained from top setts but also the shoots were more vigorous. Progressive counts showed that plots containing top setts were the first to germinate. They also had the

ability to withstand dry weather better than the others. However, top setts from arrowed cane showed no superiority over the rest of the stalk.

Setts from Outside Rows—v—Setts from Inside Rows

An investigation of this factor was included in the November trial. After hot water treatment the number of shoots which germinated from setts from outside rows was significantly greater than from inside rows but there was no difference for similar setts which had not been hot water treated. This indicated that the setts from outside rows are more resistant to the hot water.

Source of Plants

The germination of hot water treated setts of cane from “good” and “poor” sources was compared. The “good” plants were from blocks of cane which had given a good germination after hot water treatment in a previous planting in August and the “poor” were from blocks which had given a poor germination. At the same time of planting after hot water treatment the following table shows the number of shoots that resulted:—

Variety					“ Good ” Source	“ Poor ” Source
Q.50	..	..	..	..	246	153
Pindar	..	..	..	..	82	61
Trojan	..	..	..	..	186	31

Notes were taken before planting on the condition of the eyes, thickness, tons per acre, age and brix, but no consistent pattern emerged to separate the “good” source from the “poor.” The “poor” Trojan was arrowed badly but otherwise the canes had about equal arrowing. The results of the trial provided little worthwhile information regarding selection of fields as a source of plants. However, once a “good” source has been located, from early treatments, it seems desirable to exploit this field to the fullest extent. In this work it was possible to separate the effect of planting material from that of the cultural conditions which the plants received after

planting, and to show that source of plants is a factor in the poor germinations.

Plant—v—Ratoon

Hot water treated setts from both plant and ratoon cane were included in some of the trials in order to determine whether this factor had any influence on germination. At the same time were included a number of sources of material. Three varieties, Q.50, Pindar and Trojan were used.

On the evidence obtained it did not appear that this factor had very much influence on germination.

Effect of Cooling Treatments

In an effort to ensure better germination there have developed a number of district practices of cooling setts after their removal from the hot water. Hosing and dipping in a cold aretan solution for 20 minutes have both been practised. A trial was therefore undertaken with a view to determining whether the treatments had any beneficial effect.

The accompanying table shows the average number of shoots in each of the treatments.

Treatment	Varieties		
	Q.50	Pindar	Trojan
Hosing	29.2	31.0	21.5
Aretan Dip	27.9	30.1	22.0
No Cooling	29.8	31.3	30.3
Control (no h.w.t.) ..	31.4	29.1	38.8

The differences between treatments are significant only for Trojan for which cane the no-cooling treatment was better than the cooling treatments. Hence, no evidence was obtained to justify cooling treatments and, in fact, they were deleterious to Trojan.

MINOR ELEMENTS

Droopy Top (copper deficiency) continues to appear in isolated instances as new areas are opened up for cultivation. Application of copper

sulphate at about fifty pounds per acre gives complete control of the trouble.

Preliminary work was carried out in connection with unexplained cases of what appear to be nutrient deficiencies in the Ingham district, and a method of introducing solutions of salts of essential elements into the cane leaf was devised. The method utilizes the negative pressure in the vascular system to inject a solution of the element into a cane leaf. This is achieved by dipping the cut-off end of a cane leaf, still adhering to



Access roads bulldozed around Cowley Hill to allow spraying of giant sensitive plant.

the plant, into a vessel containing the nutrient in solution which is then rapidly drawn up into the leaf. The method may also prove useful with virus inoculations.

SOIL CONSERVATION

Considerable demand has been made for soil conservation advice. Contours have been surveyed and established on 224 acres made up as follows: Isis—163 acres, Gin Gin—36 acres, and Maryborough—25 acres. Guidelines were established on a further fifty acres, while additional requests for levels and advice on drainage and irrigation problems have been attended to. Contours have generally been surveyed at seventy-

five feet to ninety feet intervals depending on field slope. Waterways are established at regular intervals down the slope so that the distance of flow in any one direction along contours rarely exceeds eight chains, and is frequently much less. The contour gradient originally used was 0.8 per cent. but this was found to be inadequate for the quantity of water sometimes being handled by contours. In the heavier red soils, a minimum gradient of one per cent. is now used and this is often increased up to two per cent. for very short distances. In light sandy soils these gradients would quickly cause scouring. Variable gradients were frequently used when surveying contours and this allows them to be established closer to parallel.

Much of the contour work has been highly successful, but some failures have occurred, mainly due to (i) fields not having been levelled prior to contouring, and (ii) inadequate maintenance of structures after establishment.

Along with contouring, an attempt has been made to interest farmers in strip cropping their contoured fields, re-locating headlands, grassing waterways, building structures across gullies to prevent their extension and otherwise minimising soil losses.

WEED CONTROL

Dalapon continued to give very good results against reed grass (*Phragmites communis*). The most useful results are obtained by making two sprayings, the first killing most of the infestation while the second is necessary to eradicate any re-growth. Economic applications are at the rate of 20 to 30 lb. of Dalapon per acre.

In an effort to control the spread of guinea and para grasses in North Queensland canefields a large number of trials was set out using Dalapon in many districts from Cairns to Ingham. It was found that this chemical, in heavy applications, will markedly depress growth and, in some cases, completely eradicate the stools of both of these grasses. However, an unsolved difficulty lies in the fact that these applications are not economic and costs of £60 to £70 per acre for the required repeated applications prohibit any major practical use of the method.

Aerial application of 2,4-D is now a routine

practice for the control of vine weeds in northern cane fields. A usual dosage is one pound of 2,4-D in five gallons of water per acre. Some preliminary trials using 2,4-D as a finely ground dust have also given excellent control of these weeds. This work is to be continued, using a power duster designed to project the dust over a considerable distance. The Wild Passion vine proved non-susceptible to 2,4-D but was killed by Dalapon.

Methyl bromide fumigation has given good results against nut grass on the Lower Burdekin station. Promising control of this weed has also been obtained with D.B. Granular, although the results have not always been consistent.

Co-operation in the campaign against giant sensitive plant (*mimosa invisa*) occupied a considerable amount of time in the Mourilyan, South Johnstone and Tully areas. The serious threat to canefields due to this weed is now being rapidly

decreased and the application of dilute arsenical sprays is proving most effective.

Soils Tested for Rate of Decomposition of 2,4-D and MCPA

Twenty-two soils were tested (using the cucumber seedling method) for rate of decomposition of 2,4-D and MCPA. Analyses were also conducted on the soils for N, P, K and organic matter content, and also pH. There was a large variation in time of decomposition within the soils, viz., 12 to 48 days for 2,4-D, and 27 to more than 68 days for MCPA. Scatter diagrams have been constructed plotting time of decomposition against the figures obtained from the soil analyses. There was a poor correlation between time of decomposition of 2,4-D and MCPA, i.e., soils which decomposed 2,4-D relatively quickly did not necessarily decompose MCPA quickly. None of the factors examined



The Kestrel power duster. This machine is being experimented with to assess its value for 2,4-D dusting in cane fields.

appeared to be correlated with time of decomposition of MCPA. On the other hand, the decomposition of 2,4-D showed some correlation with organic matter, pH, N and K. In no instance was the correlation a close one, but the higher the organic matter content the shorter the time of decomposition. This was also the case with total nitrogen. High pH appears to favour decomposition and so does high K content of the soil. From these correlations it seems that the more fertile soils are the ones which decompose 2,4-D quickly.

Some studies were carried out on the decomposition of 2,4-D and MCPA in the presence of contaminants such as cresol and dichlorophenol. Comparisons were also made of the decomposition rates of the sodium and amine salts of 2,4-D. No consistent differences were obtained between any of these materials and their stability in the soils examined showed little variation.

SOME STUDIES WITH COWPEAS

Cowpea Wilt Trial

A wilt trial involving sixteen cowpea varieties was planted on 4th February. A total of nearly 50 inches of rain was recorded during the course of the trial and waterlogged conditions were experienced on a number of occasions.

The results showed differences between varieties but, in general, the agreement between the results and those of a similar trial set out last year was poor. There was a great deal of variation between replicates of the same variety indicating that the level of infection over the area of the trial was not uniform. A similar state of affairs was evident in last year's trial. One pleasing aspect was the resistance again shown by Black Eye No. 5 and C.P.I.12153, both of which were resistant last year.



Bagasse being spread on a cane farm in the Pleystowe area. The application rate is probably 80 tons per acre.

Nematodes on Cowpeas

The cowpea varieties Malabar and Reeves on one block at Meringa were found to be badly affected with root-knot nematodes (*Meloidogyne* sp.). The above ground symptoms on Malabar were yellowing and death, but Reeves was not showing any symptoms. The roots were examined and found to be very knotted. A similar state of affairs was found on the Reeves also. Other blocks on the station were examined and one other was seriously affected. This block had velvet beans growing on it also and these were found to be only very slightly affected. A survey of the cowpea fields on district farms was conducted and, although symptoms were not as bad as on the station, root knots were found in eight of twelve fields examined.

Cowpea plants in the wilt trial were also examined for root knots. A value was given each plant and an index for the variety was worked out from the sum of these values. There was a great deal of variation between replicates but the results indicated that varieties differ in their degree of susceptibility.

Pot Trial to Determine Resistance to Nematodes

Seven varieties were tested in the trial. The procedure was to inoculate sterilized soil with minced root knots from Malabar and to compare growth in the two classes of soil. The first symptom was a wilting in the inoculated pots, and then death of plants. The infested plots contained only 56 plants after about five weeks compared with 109 in the sterilized soil. All varieties suffered greatly from the nematodes but Malabar, C.P.I.9247 and C.P.I.12153 were the least affected.

ANALYTICAL WORK

Soil Samples Increased

The Brisbane laboratory issued fertilizer recom-

mendations on 1,523 soil samples taken from farm properties. These were from all districts except Mackay, since the laboratory at that centre handled its own district soil samples (869) during the year. Of this total of 2,392 farmer's samples, 42 per cent. were low in available phosphate and 48 per cent. were low in available potash. The tendency towards potash deficiency was less marked than in previous years, but it is as yet too early to attribute this to the known increased usage of potash fertilizers. In Brisbane 663 soils from experimental plots were also analysed and 178 similar samples were handled at Mackay.

The soils analysed at both laboratories therefore totalled 3,233 samples which is a considerable increase on previous years. Other analyses included 373 leaf samples, which were mainly from the potash nutrition trials.

High K₂O in Molasses

Final molasses samples taken weekly from a southern mill were analysed for nitrogen, phosphoric acid and potash. It is of interest that in these samples nitrogen showed a regular increase over the period, being 0.57 per cent. in August and rising to 0.88 per cent. in October. Phosphate and potash showed no consistent variation with the time of sampling. The high figure of 8.6 per cent. K₂O was obtained and this is by far the highest recorded for any Queensland mill.

Saline Soils

An investigation was made into crop failures associated with saline soils at Moore Park in the Bundaberg district. A survey indicated that excessive quantities of magnesium sulphate were present in some soils, while others carried a high concentration of sodium chloride. Following recommendations based on this work, improved drainage schemes have been attempted. Regular samplings are in progress from these saline areas to determine whether any amelioration of these unsatisfactory conditions is being effected.



Q.67 on rich land at Meringa. This variety resists lodging.

Northern Sugar Experiment Station

G. Bates, Officer in Charge

Weather and Crop Notes

Rainfall for the period under review was 75.01 inches which is close to the average. The soil was in good condition for the growing crop at the commencement of the 1957-58 season. July rainfall was slightly above average, covering 20 wet days. This caused a hold-up in pre-harvest burns, and the cultivation of young cane in the wetter areas. Then followed one of the driest periods on record at this station. For the 90 days ending on October 30th only 16 points of rain was recorded on nine wet days. August was the driest on record yielding only two points of rain, which was followed by three points in September. Despite the dry period the crop did not suffer so much as expected, due probably

to the adequate deep soil moisture at the commencement of the dry period. Good rain fell in November, but crops received a further setback in December. January produced some of the hottest and most unpleasant weather experienced for many years. The maximum temperature of 103°F. was the hottest experienced in January since 1935 when 105°F. was recorded. Wet season rain came late, and there was a dry spell in March. However, the wet season continued late with high temperatures, and good growing conditions continued through the autumn. Crops in the area were in good condition for the 1958 harvest, there being very little lodged cane. Isolated occurrences of heavy wind from storms caused some stem breakage in Pindar, but no general gale force winds were experienced. Owing to the gentle nature of the wet season only one period of flooding took place and the loss was negligible. Q.66 has contributed to this state of affairs, being a variety that is resistant to lodging on flooded country.

1958 Planting Conditions for 1959 Crop

Rainfall for the 12 months ending June, 1958 amounted to 75.01 inches compared with the 34-year average of 74.86 inches. Precipitation for the six months January to June, 1958 inclusive was 69.18 inches, being nine inches above average. Although March rainfall was higher than normal there was a dry spell during the month which

RAINFALL RECORDS, 1924-1958.

Year	Rainfall in inches	Year	Rainfall in inches
1924-25	82.86	1941-42	41.55
1925-26	49.02	1942-43	64.60
1926-27	80.34	1943-44	52.92
1927-28	72.46	1944-45	120.34
1928-29	92.83	1945-46	63.95
1929-30	69.99	1946-47	35.24
1930-31	75.62	1947-48	69.12
1931-32	61.87	1948-49	85.77
1932-33	90.02	1949-50	83.50
1933-34	119.09	1950-51	67.68
1934-35	58.22	1951-52	52.86
1935-36	87.64	1952-53	83.98
1936-37	49.54	1953-54	68.15
1937-38	53.28	1954-55	99.81
1938-39	126.79	1955-56	71.91
1939-40	82.10	1956-57	76.27
1940-41	80.59	1957-58	75.01

Average Rainfall for 34 years: 74.85 inches.

allowed preparation of land for early (autumn) planting but the prolonged wet season did not

allow the area to be planted as was earlier expected. Germinations were good, and where failures occurred it was found that mercurial dips had not been used.

Pests and Diseases

The disease position in the Mossman-Babinda area is generally good. The ratoon stunting disease position has improved, while chlorotic streak remains static. Leaf scald is confined mostly to farms in Babinda and Mossman, while bacterial mottle exists on two farms in Hambledon and several in Mossman. Droopy top has been noticeable on sandy soils in the Mossman area. Yellow spot developed poorly this year and was at its lowest ebb since it was first identified in Queensland.

EXPERIMENT STATION OPERATIONS

Seedling Raising and Selection

In conformity with usual practice, fuzz was planted in the glasshouse late in July, and subsequently a grand total of 31,700 seedlings were planted in the field in October. These consisted of 7,674 spaced seedlings and 2,405 bunches.

Selections during June, 1958 resulted in 1,113 seedlings being selected for planting in 30, 10 and 4-sett plots, while 23 varieties were selected

Abstract of Meteorological Observations made at Northern Sugar Experiment Station, Gordonvale, from 1st July, 1957 to 30th June, 1958.

Month	Rainfall in Inches	Average Rainfall	No. of Wet Days	Shade Temperature						Mean Diurnal Range	Mean Temper- ature 9 a.m.	Mean Per Cent. Relative Humidi- ty 9 a.m.	Average Daily Hours Sun- shine
				Maximum			Minimum						
				High	Low	Mean	High	Low	Mean				
1957—													
July	1.21	1.05	20	84.0	71.5	77.92	67.0	50.0	62.24	15.68	69.34	86.94	2.33
August	.02	.94	2	89.0	75.0	82.16	65.5	49.0	58.06	24.10	70.19	76.42	6.80
September	.03	1.15	2	90.0	81.5	85.77	63.5	51.0	56.90	23.87	74.37	65.33	9.13
October	.59	1.55	5	94.0	82.0	89.74	70.0	53.0	62.71	27.03	79.66	63.58	9.26
November	2.45	3.02	8	95.0	83.0	91.95	75.0	61.0	68.82	23.13	82.07	67.11	9.26
December	1.53	5.11	10	96.0	88.0	93.17	75.5	66.5	69.92	23.25	83.69	63.32	8.60
1958—													
January	15.64	15.87	17	103.0	80.0	90.97	77.0	64.5	72.27	18.70	80.48	80.00	5.43
February	20.50	19.29	19	98.5	82.0	90.20	79.0	71.0	73.89	16.31	81.11	84.28	4.36
March	19.02	15.16	15	101.5	81.0	89.93	76.0	67.0	71.69	18.24	80.61	84.32	6.43
April	8.69	6.08	21	95.0	80.0	85.01	76.0	64.0	70.43	14.58	78.30	84.76	4.34
May	2.53	2.63	12	89.0	80.0	84.03	72.0	59.0	65.82	18.21	76.19	83.45	5.17
June	2.80	2.12	8	85.0	76.0	81.67	70.0	56.0	63.15	18.52	71.72	82.97	4.70

from the 30-sett plots for planting in a lattice square variety trial.

The red rot disease resistance trial was ratooned, as the plant crop did not produce any definite information.

New Varieties Imported

Thirty-one new varieties were introduced to this station during 1957 for cross pollination work and for trial as commercial canes. These were :— B.37,172, B.4459, B.46,199, B.47,258, B.47,380, B.48,123, B.48,124, B.49,311, C.P.48,103, G.107, H.38-2915, H.44-3382, H.45-2654, H.46-919, H.47-3756, H.47-4635, H.48-3166, Mol.894, Mol.914, 50 B.N.7727, 50 B.N.8186, M.11-43, M.31-45, R.386, R.397, R.447, P.R.980, P.B.52-1-7, 47 R.4066, 49 R.3863, U.S.52-9.

Experiments Planted During the Year

A latin square varietal trial using the varieties M.614, M.701, C.P.43-47, H.40-1184 with Pindar

as a standard, was set out on Division A3. A randomized yield observation plot, having four replications, was planted in 1957; this consisted of 21 varieties plus Pindar as a standard. The varieties included Q.70 and Q.58, with 19 of the 55-series canes.

Legumes

A trial to test sundry varieties of legumes against wilt was set out in Division C1. Results indicated that Black Eye No. 5 and C.P.I.12153 continued to show a high degree of resistance. However, other varieties performed differently to previous trials.

Heat Treatment Germination Trials

Trials were conducted to determine which portion of the cane stalk would withstand heat treatment best. Results were in favour of using top plants from non-arrowed sticks. It should be noted, however, that these trials were conducted mid season to late in 1957. A further trial early



One of the laboratory buildings on Meringa Station.



Centro—a tropical pasture legume—can be a pest in cane if not checked.

in 1958 crushing, using immature cane, indicated that butts gave slightly better germination.

One trial to determine whether or not any advantage was to be gained by rapid cooling of treated plants with water, showed that cooling was not beneficial.

Experiments Harvested During the Year

The first ratoon randomized trial on Division A1 was harvested. Canes showing the best performance were H.40-1184 yielding 6.28 tons of sugar per acre, N.685 yielding 5.69 tons and C.P.43-47 yielding 5.01 tons, compared with the standard variety Pindar yielding 5.36 tons.

The plant randomized block on Division A4 was harvested and the varieties showing the most promise were 54-6441—5.94 tons sugar per acre, 54-7103—5.91, and 54-7096—5.0, compared with the standard Pindar of 4.67 tons of sugar per acre.

Field Day

Field Day was held on 22nd May when approximately 400 persons visited the station. The weather at the time was ideal for planting, and this, following a period of rain, reduced the attendance considerably.

Breeding Cane Collection

The variety garden was maintained and there are now 452 varieties on the station, exclusive of original seedlings and seedlings under test. Varieties not actually used in breeding work, and other varieties which are kept for various purposes, are being gradually transferred to the Elliott variety garden to make room for many varieties which are continually being brought into breeding programme.

Miscellaneous

A further three acres of scrub was cleared during the year, and the land will be brought under cultivation.



Malabar pea growing in a Meringa block.



Harvesting a randomised variety trial on Meringa Station.

Laboratory Work

The following is a summary of cane samples handled during the year:—

Station and trial cane samples	1,581
Farmers' samples	58

Summary of crops grown on the station:—

	<i>Tons</i>
Parent canes, and trials ..	466.880
Original seedlings	52.790
	519.670

Plant cane harvested for the mill ..	330.185
Ratoon cane harvested for mill ..	189.485
	519.670

Used for plants, samples, cross-pollination, etc.	51.5
	571.17

Area plant cane harvested ..	12.2	acres
Area ratoon cane harvested ..	8.8	acres
Average tons per acre ..	27.2	



Harvesting plots on the Experiment Station.



Sand deposited on a cane crop during the 1958 flood in the Burdekin River.

Lower Burdekin Sugar Experiment Station

G. A. Christie, Officer in Charge

Weather and Crop Notes—

The year under review provided contrasts in almost all weather conditions to be expected in this tropical area of Northern Queensland. A maximum temperature of 105°F. on 23rd January, 1958, was the highest on record for many years, while the lowest recorded for the year, 40°F., although not the lowest ever, was not far short of the frost conditions occasionally occurring in the area. The year's rainfall was slightly above the average for the area but it followed the pattern common from past experience, i.e., a dry spring and early summer, yielding 3.29 inches for the last six months of 1957 and a wetter period in the early part of the year. While no unduly heavy falls were recorded in the late summer or autumn of 1958, heavy rain in the watershed of the Burdekin River caused two floods in February and April of 1958. The first in February was

of major proportions causing some damage in the cane growing area of the Burdekin delta, but the April flood assumed proportions greater than those ever previously measured. The modern cane varieties resisted the effects of this major flooding reasonably well, but land not under crop suffered seriously with a removal of top soil on several hundred acres of highly fertile land, while the deposition of sand may also affect future crop production.

While not of cyclonic force, winds of high velocity affected the Lower Burdekin area early in April, when severe damage was inflicted on the Bowen area to the south. The very mild conditions extending through May to early June, 1958, were very beneficial to the autumn plant crop for 1959 harvest, but this excellent weather resulted in lower than normal sugar content of crops for the start of the 1958 crushing season.

An abstract of meteorological observations recorded at this Station for the period 1st July, 1957, to 30th June, 1958, is submitted on page 44.

Cane Diseases

The supply of hot water treated planting

material (50°C. for three hours) to cane growers of the Lower Burdekin area has been continued by the efforts of the district Cane Pest and Disease Control Boards, and the constant work of the Supervisors of these Boards is playing a large part in reducing the incidence of and losses from ratoon stunting disease. District cane growers are co-operating well and the improved growth from treated cane encourages its use.

The difficulty in detecting reliable symptoms of chlorotic streak disease made further farm surveys in the Giru area impractical, but by restricting the movement of planting material from farms known to have the disease, and by encouraging the use of disease free planting material on these farms, it is hoped that the position will be improved.

The unknown disease, which was recorded previously in the varieties Q.57 and Pindar, has been under regular observation by Bureau pathologists and, while some progress has been made, its cause is still obscure. By imposing a quarantine

on all farms affected, its further spread may be prevented. District crop losses place it in the category of minor diseases, but losses by individual cane growers warrant the measures which have been accepted on the farms affected.

Practically every cane grower in the area now uses a mercurial solution for the pre-planting treatment of cane setts and, apart from its control of the sett-rotting pineapple disease, the more rapid germination of treated plants is an important factor encouraging its use. In some instances the quality of planting material being used has deteriorated in recent years, and some poorer germinations can only be attributed to the use of lodged or damaged cane for plants.

An internal stalk deterioration, known locally as Burdekin sour rot, has been located fairly extensively in the crop for 1958 harvest. Normally occurring as varieties approach maturity, its appearance this year is somewhat earlier than usual affecting varieties which are obviously immature. The condition has been on record for



An excellent Q.67 crop in the Inkerman area. This crop was so badly flooded that silt is adhering to the stalks eight feet from the ground.

many years, but no causal agent has been isolated, and its occurrence appears to be associated with seasonal conditions.

Specimens of a number of minor abnormalities in district crops were submitted for pathological examination, but it is anticipated that none of them will be of any economic importance.

Insect Pests

The crop for 1958 harvest shows no visible damage by greyback cane grubs and this is due largely to the extensive area protected by applications of BHC, and perhaps to a lesser extent by weather conditions being unfavourable to the survival of the grubs. Much of the area normally affected by this pest was flooded for a week or more, while the soil remained in a completely saturated condition for a considerable period.

A recent development by a Lower Burdekin cane grower is the application of Lindane, the refined gamma isomer of BHC, in a water suspension to give protection from greyback grub damage. The insecticide is held in suspension by being suitably agitated, and the considerably lower cost of this material compared with the normal dust may make it an important contribution to the industry in areas where damage from white grubs occurs.

Termites continue to affect cane in some parts of the district but losses are quite small.

Other Pests

Cane losses comparable with those of the average year occurred in the Lower Burdekin and Giru areas from coots, wallabies and wild pigs, the firstmentioned being most numerous near lagoons, while the latter two enter the cane areas from adjacent grazing land. Some measure of control of coots has been obtained from the distribution of poisoned grain on headlands near lagoons, while organized shooting drives accounted for hundreds of wallabies and some wild pigs during the year.

Legumes

Legume cover crops continue to be used to only a limited extent in this area and the beneficial effect on the physical condition of the soil is often demonstrated in an improved water penetration in the following crop. Experiments

in this area have showed that an application of nitrogenous fertilizer may be desirable in the cane crop following a heavy legume cover crop.

The search for new legume varieties was carried a step further when seed of ten legume crosses produced at the Northern Experiment Station was planted on this Station. Seed will be collected for several years in attempting to select and fix strains of suitable types.

District Varieties

The variety Trojan continues to provide a large proportion of the cane milled in the Lower Burdekin and Giru areas and was again extensively planted in 1958. Comparatively high early sugar content plus excellent vigour and ratooning, place Pindar in second place with Q.57 and S.J.16 following at a lower level on the planting list. Other varieties constitute only a very small percentage of the total crop.

The new Burdekin seedling, Q.67 (Trojan x Q.27) was released for general planting in the autumn of 1958, and its anti-lodging characteristic was again demonstrated when little damage occurred



A heavy crop of Q.66 at Home Hill which was badly flooded earlier in the year.



Badly eroded cane land at Jarvisfield in the Lower Burdekin. This field was fallow at the time of the flood.

in propagation plots which were subjected to fast flowing flood waters of the Burdekin River. Its comparatively high early sugar content was again evident from samples taken early in the 1958 harvesting season.

EXPERIMENT STATION OPERATIONS

Seedling Raising—1957 Series

This important phase of the Station's activities has proceeded and expanded by the establishment of observation plots of the leading new varieties on farms in the district in addition to plantings on the Station.

Seed produced by cross pollination on the Northern Sugar Experiment Station was forwarded to this centre, and the first glasshouse planting was made on 10th July 1957. Germination failures occurred in about 50 per cent. of the sowings, and this continued in four subsequent plantings. The position was further aggravated by death of some of the seedlings in the glasshouse. The cause of these latter losses has not

been determined and the complaint has not been controlled, although some experimental plantings were made later to investigate possible measures to avoid losses in future years. In all, seed from 147 bi-parental crosses was planted and 76 failed to germinate. Many of the remaining 71 crosses gave poor stands, and finally only 47 families were represented in the field planting of 6,240 seedlings. A small area of bunch planted seedlings was also established to determine whether the seedling selection procedure should be modified, and also to extend the number of original seedlings planted annually.

One hundred and forty-four seedlings were selected in June, 1958, from the 1957 planting and these will be included in further trial plantings, while stalks from the bunch planted seedlings will be propagated as single stools for selection in 1959.

1956 Series

The total number of new varieties planted in

40-sett plots in 1957 was 181, comprising 136 selections from the Lower Burdekin Station's seedlings, together with introductions from the Northern and Southern Experiment Stations and varieties from other countries. Many plots of district standard varieties were included for comparison with the new canes and, when re-selected in June 1958, 31 were considered suitable for planting in more advanced trials on this Station, while plots will also be established on district farms.

1955 Series

Nineteen Burdekin seedlings and seven introductions from the Northern Experiment Station were selected from 40-sett plots and planted in a yield observation trial where each new variety was replicated four times with numerous plots of the two principal standard varieties of the area. Yield, general agricultural characteristics, and maturity tests will form the basis of future selection. Some of the varieties under trial have lodged and

this will assist in rejecting some as unsuitable types.

1954 Series

In 1956, 27 seedling canes were planted in a replicated yield trial and, at harvest of the plant crop in 1957, one was found to be superior to Trojan, while four exceeded Pindar in the return of sugar per acre. Harvest figures for these were as follows:—

Variety			Tons Cane/Acre	c.c.s.	Tons Sugar/Acre
54/547	..	..	51.30	17.69	9.07
Trojan	..	..	46.88	17.94	8.36
54/414	..	..	48.34	17.26	8.32
54/493	..	..	44.92	18.24	8.22
54/555	..	..	43.47	18.03	7.83
Pindar	..	..	44.25	17.70	7.82

54/547, 54/414 and 54/555 were selected for inclusion in an advanced trial, but 54/493, a late maturing variety showed poor cover, after arrowing heavily, and profuse side shooting in the plant



Water hyacinth deposited on cane by the Burdekin flood waters.

crop. It is therefore considered not suitable for local conditions.

1953 "N" Series

Three "N" series seedlings could not compete with the standards in the plant crop of the randomised block trial, but the fourth, N.446, with particularly high sugar content at harvest, was superior to all others in the trial. Its slow germination and ratooning coupled with profuse arrowing may not make it acceptable for commercial sugar production, but observation plots of this variety will be established on district farms. Plant crop yields were as follows:—

Variety		Tons Cane/Acre	c.c.s.	Tons Sugar/Acre
N.446	.. ..	45.45	19.80	9.00
Pindar	.. ..	47.14	18.22	8.62
Trojan	.. ..	41.08	18.75	7.72
N.434	.. ..	39.74	18.46	7.33
N.449	.. ..	36.76	18.40	6.76
N.435	.. ..	35.87	18.61	6.66

1952 "M" Series

The seedling variety M.421, mentioned in earlier reports as being the leading one of its series, failed badly in tonnage per acre in ratoons. It still retained the characteristic high sugar content, and further planting of observation plots on district farms has been limited, pending added information on its ratooning ability.

Varieties which were introduced for trial on poor and unirrigated land have been tested on a number of farms in the area, and the results suggest that two, Q.58 and Q.63, may find a place in certain localities. The former has given a good crop of thin cane with comparatively high early sugar content on poor land, while Q.63 has shown particularly high sugar content, but its lesser vigour probably requires it to be grown on soils of higher productivity. Other later maturing types are still under trial, but their future is uncertain.

Isolation Plot

In this area which is comparatively free from



Army worm damage to cane foliage at Iona, Home Hill.

Table 1.

Abstract of Meteorological Observations made at the Lower Burdekin Sugar Experiment Station for the Year 1st July, 1957, to 30th June, 1958.

Month	Reinfall (Inches)	No. of Wet Days	Shade Temperature						Mean Diurnal Range	Mean Temper- ature 9 a.m.	Mean Per Cent. Relative Humi- dity 9 a.m.
			Maximum			Minimum					
			High	Low	Mean	High	Low	Mean			
1957											
July	.82	6	83	62	75.68	61	40	54.55	21.13	66.69	75.45
August	.28	3	88	66	78.96	59	49	54.28	24.28	69.56	73.24
September	.11	1	87	78	82.25	59	48	54.00	28.25	75.17	57.71
October	.54	2	89	81	85.83	73	52	62.00	23.83	81.04	64.33
November	.64	2	96	85	88.95	77	61	68.35	20.60	84.40	62.61
December	.90	2	93	85	88.42	74	58	68.00	20.42	84.13	62.63
1958											
January	6.09	7	105	84	89.09	77	65	70.71	18.38	85.00	70.57
February	21.59	19	93	79	86.43	77	67	72.50	13.93	81.00	81.66
March	6.37	10	94	79	87.35	77	67	71.52	15.83	82.36	75.20
April	3.60	9	89	79	84.32	79	62	68.00	16.32	78.36	79.23
May	.13	1	88	79	82.75	68	57	62.58	20.17	75.42	74.00
June	3.47	11	82	69	77.08	69	47	59.30	17.78	68.23	80.62
Totals	44.54	73									

many of the major cane diseases, precautions are necessary in introducing new varieties for trial in the area. The Regional Experiment Station at Millaroo in the Burdekin Valley has provided suitable facilities, but varieties introduced from the Northern Sugar Experiment Station in 1957 were attacked by termites and some were completely destroyed. A new site on the same Station will be selected for future plots.

BHC Toxicity Trial

The ratoon crop of the second cycle of this trial was harvested in 1957, and results continue to indicate that no toxic effect on crops is apparent following applications of crude or refined BHC, in quantities heavier than those normally used.

Irrigation Trial

A well replicated trial to study the effects of different amounts of irrigation water on the growth and sugar content was established and maintained throughout the year under review. Some plots received water when soil moisture had been reduced to wilting point while other plots were irrigated when two thirds of the available

moisture had been used. Considerable differences in crop are visible and yields will be obtained when the field is harvested during the 1958 crushing season.

Ratoon Investigations

The high plant/ratoon ratio continues to operate in the Lower Burdekin and Giru areas, and qualitative and quantitative trials to investigate this important aspect of commercial sugar production have been established on this Station. Within the next few years, some interesting data can be expected and, anticipating that the area may eventually discard its "plant cane" policy, the ratooning ability of all new varieties is being assessed in experimental plantings.

Nut Grass

Preliminary experiments aimed at eradicating nut grass from the Experiment Station were carried out, prior to attacking the problem on a larger scale. Soil fumigation with methyl bromide appears to give satisfactory results, using one and a half pounds of the material per 100 square feet of area, but a greater time interval is necessary before accurate conclusions can be drawn.

Field Day

A very successful Field Day was held at this Station on 20th May, 1958, under favourable weather conditions. Visitors were interested in all phases of the Station's work, particularly those associated with the production and testing of new varieties. They provided an attentive audience to addresses by the Director, members of the Sugar Experiment Stations Board, and other prominent industry representatives.

Laboratory Work

The following summary shows the analyses of cane samples during the year under review:—

Experiment Station samples	..	513
Farm trial samples	.. ..	325
Growers' samples	.. ..	11
		—
		849
		—

In addition hundreds of soil moisture determinations were necessary for the correct control of the field irrigation trial.

SUMMARY OF CROPS GROWN ON THE STATION

		Tons.
Q.57	.. ..	179.88
Trojan	.. ..	39.64
Pindar	.. ..	40.58
Mixed Experimental Varieties	..	636.14
		—
	Total ..	896.24
		—
Plant Cane Harvested	.. ..	444.72
First Ratoon Cane Harvested	..	430.65
Second Ratoon Cane Harvested	..	20.87
		—
		896.24
		—
Total Cane Harvested for Milling		896.24
Sold for Plants	.. ..	67.80
Used for Plants, Samples, etc.		
(estimated)	.. ..	52.00
		—
	Total Crop ..	1,016.04
		—
Total Acreage Harvested		26.74 acres
Average Tonnage per Acre		37.77 tons



The new Experiment Station building occupied one of the few dry spots on the Station during the February floods.

Central Sugar Experiment Station

C. G. Story, Officer in Charge

Weather and Crop Notes.

General rainfall throughout the district on the 24th and 25th July, 1957, with further widespread district rainfall during mid-August upset the crushing programme at district mills for a few days at each period. For the first time since 1935, no rainfall was registered at the Sugar Experiment Station in September and this was a dry month throughout the central district. October continued dry except for a freak storm on the 2nd, when falls of up to one inch were recorded at some cane centres between Carmila and Mackay; unfortunately this rain was not district-wide. These two months were ideal for harvesting and, due to a combination of good weight in cane,

good supplies at the carrier, and factory performance above average efficiency, the district mills established crushing records.

Scattered rainfall at Mt. Charlton and Proserpine late in October was followed by excellent rainfall in the Sarina to Flaggy Rock areas; the latter area recorded seven inches. This rain was most welcome as this particular section had experienced drought conditions since the beginning of the year. Rain occurred early in November but, after the 8th, the month was practically dry, although storm rain at the end of the month brought relief to the Calen area. December was also dry. The 1957 harvest season terminated on the 19th December when Racecourse mill ceased crushing. One of the reasons for the successful 1957 crushing season at Mackay was climatic; the absence of rain interference provided a favourable season for harvesting.

The rainfall for the calendar year 1957 at the

Sugar Experiment Station was 41.90 inches recorded on 100 days, the lowest since 1948, when 41.80 inches were recorded. From the 1st July to the 31st December 10.58 inches were recorded on 25 days.

At the beginning of January, 1958, widespread rains changed Mackay district's weather position from drought to near flooding with torrential rainfalls. Above average rainfall occurred in three defined periods during both January and February. Typical monsoonal conditions with torrential deluges were experienced during mid-February, and the worst floods in the history of Mackay were receding slowly on the night of the 18th. It was the wettest February on record since 1871. Finch Hatton suffered, Foulden settlement was devastated, alluvial land was eroded, crops were destroyed, and bridges and property were severely damaged. Some individual cane growers and citizens lost heavily.

Good rainfall was experienced in March, and damage from flood rains again occurred at the beginning of April when Mackay experienced wind from the fringes of the Bowen cyclone. The concrete Forgan bridge was damaged by these flood waters and a repetition of earlier damage occurred in the previously flooded areas. Heavy rainfall was experienced at the beginning of June, while widespread rainfall at the end of June disrupted the start of the 1958 crushing at district mills.

Cane growers commenced planting in July, 1957, under ideal weather conditions; early young plant and ratoons made rapid growth. Temperatures were below normal on the 24th and 25th July but rainfall prevented frosts. This rain, with a cold southerly snap, brought bleak wintry conditions to the whole of the district.

Although rainfall in August delayed district-wide planting, it was in full operation at Proserpine



This general view of the lower side of the Experiment Station illustrates the bad drainage condition which exists in this area.

and on better drained areas by mid-August ; general planting proceeded during the last week of the month. There were excellent blocks of well advanced early plant cane in the area by September. At the end of this month, young plant and ratoon cane was continuing to make progress, and standing cane was maintaining good condition. Planting continued until early September at Proserpine and was completed by the end of September in the remainder of the district. Cane planted just prior to heavy rain in August germinated very slowly but rapid germinations were experienced for cane planted at the end of August and early in September.

Many blocks of autumn plant cane were out of hand by the end of November. The later-planted cane and young ratoons appeared to withstand the drier conditions better than the well advanced early plant and ratoons although, despite the dry weather, the cane crops were generally in good condition.

Following recovery after the excellent rainfall at the beginning of January, all cane crops made fast progress under the ideal growth conditions which prevailed. Good growth conditions were experienced during March and this continued following rain in early April. Crops were in good condition at the end of that month, but a certain amount of cane in the area was left semi-erect following rain and heavy winds.

Autumn planting, later than usual, began on better drained areas during late April. Weather was ideal for planting in May and growers were well ahead with planting on the drier areas, but very little had been done at Proserpine. Cane planted in April and early May produced good germinations and made good early progress. Due to the earlier seasonal conditions most of the 1958 planting will be done in July-August.

Pests

Damage to the 1957 crop from both greyback

ANNUAL RAINFALL SINCE 1935 AT THE EXPERIMENT STATION, MACKAY

		Rainfall				Rainfall	
Year		(Inches)		Year		(Inches)	
1935-36	..	99.57		1947-48	..	38.40	
1936-37	..	64.21		1948-49	..	46.95	
1937-38	..	47.21		1949-50	..	85.48	
1938-39	..	61.29		1950-51	..	107.63	
1939-40	..	82.86		1951-52	..	41.68	
1940-41	..	73.71		1952-53	..	56.58	
1941-42	..	57.75		1953-54	..	102.57	
1942-43	..	76.13		1954-55	..	129.44	
1943-44	..	58.67		1955-56	..	82.27	
1944-45	..	33.53		1956-57	..	55.87	
1945-46	..	68.52		1957-58	..	133.09	
1946-47	..	48.09					

Average for 23 years—71.80 inches.

Abstract of Meteorological Observations made at the Central Sugar Experiment Station during period 1st July, 1957 to 30th June, 1958.

Month	Rainfall (Inches)	No. of Wet Days	Shade Temperatures						Mean Diurnal Range	Mean Temper- ature 9 a.m.	Mean Per Cent. Relative Humi- dity 9 a.m.	
			Maximum			Minimum						
			High	Low	Mean	High	Low	Mean				
1957												
July	3.36	5	79.5	59	71	62	39	51.8	19.2	63.2	75.3	
August	3.11	6	84	62	75	62	45.5	53.7	21.3	66.8	77	
September	0	0	84.5	71.5	78.7	59	43	53	25.7	72.5	62.8	
October	.61	3	92.5	77	84.7	72	50	60.6	24.1	79.1	60.9	
November	2.96	7	92	80	87.9	74	57	65.9	22	82.9	62.4	
December	.54	4	96	86	90.4	75.5	58.5	67.2	23.2	85.1	56.8	
1958												
January	18.51	13	99	76	87.5	76.5	64.5	70.5	17	82.3	73.2	
February	61.70	19	94	76.5	85	76	69	72.7	12.3	80.4	82.9	
March	10.11	17	92	78	85.5	77	66.5	71.3	14.2	80.2	80.9	
April	23.90	19	83	75	81	76	62	68.4	12.6	75.7	81.8	
May	1.86	13	86.5	74	80.4	68	56.5	62.2	18.2	73.6	79.7	
June	6.43	13	80.5	60	74.2	70	44	57.1	17.1	67.1	79.8	
Total	133.09	119										

and frenchi grubs was assessed at 3,000 tons in cane which was not protected by BHC. The main flights of both greyback and frenchi beetles were delayed until early January, 1958. BHC was applied to over 2,600 acres in Mackay, double the area treated in 1956, and to 500 acres in the Plane Creek area. During March, army worm outbreaks occurred, mainly in the cane crops affected by flooding.

Infestations of the sugar cane bud moth were widespread in the Eton, Homebush, Rosella, Alligator Creek, Finch Hatton, Balnagowan and Farleigh areas. Larvae of soldier fly were present in scattered areas of the district.

Opossums were reported damaging cane at Sunnyside. Wallabies were not as destructive as on other occasions because of the supply of young grass. An extensive infestation of rats, the worst for many years, occurred in most of the central district, except the Cattle Creek mill area. Large amounts of phosphorus and thallium sulphate baits were used extensively to control damage; unfortunately rats were well established in many localities before baiting commenced. Small mill tests showed a loss of 1.8 units of c.c.s. in rat-damaged cane in September, 1957. Damage to young ratoon cane by rats nesting underneath in burrows was reported prior to the heavy rains of 1958.

Coots damaged cane along Plane Creek where there was a large increase in numbers over the last 12 months. Heavy white cockatoo damage occurred at Conway, Lethebrook, Preston and Gregory areas in the Proserpine mill area and at Flaggy Rock. Striga was reported from Dunwold, Owens Creek and on two blocks of cane at Carmila, where it was responsible for a considerable tonnage loss.

The discovery of a number of species of nematodes inaugurated a programme of investigational work. Fumigation trials with DD and EDB were established in the Cattle Creek mill area.

Giant Sensitive Plant

Surveys were made by Proserpine, Mackay and Plane Creek Cane Pest and Disease Control Boards in 1958. One further plant was found at Habana, one at Walkerston, and one old vine having runners ten feet long in full seed at East

Funnel Creek. A vine which was destroyed on the same property in 1957, and also one at Alligator Creek, had produced six and 29 seedlings respectively, all of which were destroyed. Some of these seedlings were flowering when only nine inches high. Seed supplies of *Centrosema pubescens* used locally should be checked, and vigilance on the part of the respective Boards will be needed to eradicate this menace.

Diseases

Bacterial mottle occurred at Kelsey Creek, Greta Creek, Dawlish, Plane Creek, Finch Hatton, Cameron's Pocket, Kolijo and Foulden. The main variety affected was Q.57. The disease was present in some of the above areas in guinea grass, and also in elephant grass at Sarina. Dwarf disease was rogued at Chelona.

Sclerophthora disease was recorded in the Plane Creek and Proserpine mill areas, while pokkah boeng was prevalent in February and March in several localities. The total number of farms with chlorotic streak disease is gradually increasing in the central district, and a replicated chlorotic streak disease trial comparing the effect of different types of planting material was planted in the Eton area in September, 1957.

The campaign by the Mackay Cane Pest and Disease Control Board for the eventual eradication of mosaic disease proceeded according to plan in the Farleigh-Habana area. Mosaic disease exists on all except 48 farms in this particular district.

The regular infusion of clean seed cane to the district is important in the programme against ratoon stunting disease. The three Cane Pest and Disease Control Boards hot-water-treated quantities of cane for individual cane growers during the 1957 season at the recommended 50°C. for 3 hours.

Ratooning

The advent of the variety Q.58 with its excellent ratooning characteristics is altering the previous district practice of a three year rotation to a longer rotation, with an increase in the number of profitable ratoon crops produced from a planting. This practice may also apply to other new varieties in the future.

Planting Material

It is evident more attention is necessary on the



The remains of a field of Q.57 at Cattle Creek after the 1958 flood. Much of the field has now disappeared.

part of some cane growers to selecting planting material and conditions for germination. A combination of wrong type of planting material, too much cover and cold, wet soil is not conducive to good germination. This combination often results in stalk rots destroying the cane in the ground.

Resistance to Flood Damage

Following the floods of 1958 the variety Q.63 exhibited a high degree of resistance to damage from flood water, submersion and silting of the growing point. Q.58 and I.106 also gave good results in this respect.

Fertilizer Advisory Service

The keen demand by district cane growers for the services provided by the Soils Laboratory was maintained, and 869 farmers' samples were analysed during the year. Appropriate fertilizer recommendations were forwarded to the growers concerned.

EXPERIMENT STATION OPERATIONS

Seedling Raising

A total of 8,382 seedlings, representing 70 crosses, was planted in the field during late July—early August, 1957. These were from cane seed planted in the glasshouse on the 5th March, 1957. Unfortunately, the Bowen cyclone affected some very advanced seedlings, but generally the cane for selection in 1958 was of a high standard, improved crosses assisting in this respect.

Annual Seedling Selection

Selection of the seedlings planted in the field in July, 1956, resulted in 335 seedlings, representing 53 families, being planted in 20-sett plots for comparison with the standard Q.50. In addition, 44 seedlings, representing four families, were selected from bunch plantings. This was a large increase on the number generally selected, but the series for selection was of a higher standard than for a number of years. Fourteen selections

made late in 1955, plus the following 21 introductions from other countries were additional to this trial planted late in August, 1957—Azul, B.4362, Cl.41/70, C.P.44/154, C.P.45/184, C.P.47/193, C.P.50/56, H.32/6774, H.36/1804, H.37/6819, H.39/3633, H.39/7028, H.44/2818, H.44/3098, H.45/2120, H.45/2708, H.48/3432, M.147/44, M.311/41, N.Co. 376 and N.Co.382.

Progressive Seedling Trials

The first ratoon crop of the yield observation trial of 37 “N” series seedlings and two Barbados canes B.40/98 and B.41/211 was harvested in November, 1957. “N” series seedlings—246, 255, 266 and 273 were selected for propagation on alluvial land at Plane Creek for a replicated trial of better land canes in 1958. Seedlings 202, 260 and 272 were planted previously for propagation and observation under forest land conditions.

The yield observation trial with 29 of the 53-series seedlings and Q.55, planted in 1956, was harvested in August, 1957. At harvest some of

these varieties compared well with Q.50. Final selection of any which justify further trial will be made on the first ratoon crop in 1958, but, to establish plant supplies, a propagation planting of 12 preliminary selections from the plant crop was made on a property in the Homebush area,

Thirty-eight of the 54-series seedlings were selected from the first ratoon 40-sett plots. These seedlings, plus H.25, Q.61, Q.70 and Vesta, were planted in a replicated yield observation trial with Q.50 as the standard. Adverse climatic conditions at planting affected the trial in its early stages but the varieties made a good recovery later.

The progressive trials with seedlings continued on cane growers' properties. A general distribution of the varieties Q.63 and Q.65 occurred during 1957 and these were added to the approved lists for the eight central district mills in January, 1958.

Variety Introductions

Twenty cane varieties released from the Bureau's Brisbane quarantine house during 1957 were



The tramline across Cattle Creek was washed away in the floods.

planted on the Experiment Station. These included B.37/172, B.43/62, B.47/258, B.47/380, B.49/311, C.P.48/103, H.38-2915, H.46-919, H.47-3756, L.77, M.11/43, M.31/45, P.R.980, R.386, R.397, R.447, 50B.N.7727, 36S.N.3424, 37S.N.335, 38S.N.3113. In addition the following were received : B.44/59, B.46/199, B.48/123, B.48/124, 50B.N.8186, H.36-7913, H.44-3382, H.45-2654, H.47-4635, H.48-3166, 47R.4066. These are being propagated for planting in progressive trials for assessing their value in comparison with advanced seedlings and commercial varieties.

Nitrogen Trial—Sulphate of Ammonia v. Urea

The second ratoon crop of this trial was harvested in October, 1957. There was a crop tonnage advantage from heavier dressings of nitrogen but the heavier applications tended to make the variety Q.50 lodge. Two hundred pounds of urea or 4 cwt. per acre of sulphate of ammonia appeared to be the limit, as most lodging occurred in the cwt. plots. There were no differences in crop

between the two forms of nitrogen. The c.c.s. figures were of considerable interest; at harvest the control plots had the lowest c.c.s., and the higher nitrogen applications did not have a depressing effect on sugar content at any of the sampling periods.

Urea has the same efficiency in supplying nitrogen for sugar cane crops as sulphate of ammonia, the choice of material depending on the price per unit of nitrogen.

Long Term Phosphate Trial

There were no significant differences in either the first or second ratoon crops of Q.50 in the first cycle, or the plant and first ratoon crop of Q.58 in the second cycle. On the basis of the original soil analysis of the trial site it is expected that a long period will elapse before significant differences might be expected.

Time/Amount of Sulphate of Ammonia Trial

The object of this trial was to determine the influence of varying amounts of sulphate of



Q.68 is one of Mackay's promising canes. It is particularly suited to sandy soils.

ammonia applied at different times on yield of cane and sugar per acre. Three periods of application viz., at planting, the end of October and the end of February, and three rates of 1.5, 3 and 4.5 cwt. per acre of sulphate of ammonia were used in addition to controls. It was not possible to carry out a statistical analysis because of variability due to wet weather and flooding.

One obvious fact in this trial was that the heavier late application of nitrogen appeared responsible for what amounted to early ratooning of a vigorous variety on poor sections of the plant crop. Many of these suckers had three feet six inches of millable cane at harvest at the beginning of October, 1957. Q.58 is a vigorous ratooning cane and, with the amount of plant food available, it commenced to ratoon in June, 1957, long before harvest, especially on poor sections of the trial.

Legumes

Ten cowpea crosses planted in October, 1957 included the following: C.P.I.9247 x C.P.I.9259, C.P.I.9259 x Black Eye, C.P.I.9259 x C.P.I.8086, C.P.I.12153 x Black Eye, C.P.I. 12153 x Malabar, Malabar x Black Eye, Q.30 x Black Eye, Reeves' Cowpea x Black Eye, Reeves' Cowpea x C.P.I.9247, Reeves' Cowpea x C.P.I.9259.

Seed collected from these plots early in 1958 was the fourth generation. It will be grown until the seventh generation before selecting and by this time individual plants should be pure lines from continual selfing. Bulk seed will be collected from the next three plantings and then selection of individual plants will be made and seed propagated from these for trials.

Field Day

Climatic conditions were excellent for the Annual Field Day on the 18th April, 1958. This was held during the period of the Q.S.S.C.T. Conference and industry representatives from most sugar districts in the State were included in the

total attendance of 600 visitors. Among the many features on the Station, a display of advanced seedlings, new varieties, specimens of diseased cane and the giant sensitive plant created considerable interest. The large tractor and implement display was excellent.

Laboratory Work

The following is a summary of the c.c.s. analyses carried out during the year:

Experiment Station	..	..	978
Farm Trials	..	..	393
Growers' Samples	..	..	157
Show Canes	..	..	29
			1,557

Summary of Crops Grown on Station.

Varieties harvested during 1957 Season :—

						Tons
Q.50	..	..	..	..	..	128.9125
N.Co.310	..	..	..	..	..	128.8625
Q.58	..	..	..	..	..	100.325
Seedlings	..	..	..	..	..	408.6625

Total	..	..	..	..	..	766.7625
-------	----	----	----	----	----	----------

Plant Cane harvested	..	..	455.1
First Ratoon Cane harvested	..	..	224.8125
Second Ratoon Cane harvested	..	..	86.85

766.7625

Total Cane harvested for Mill	..	..	766.7625
Used for samples, plants, farm propagation	..	..	28.7

795.4625

Total acreage harvested	..	..	33.03 acres
Average tonnage per acre	..	..	24.08 tons



Portion of the Bundaberg Experiment Station.

Southern Sugar Experiment Station

H. G. Knust, Officer in Charge

Weather and Crop Notes

The influence of the scanty rainfalls experienced during the winter of 1957 was extended into the spring months. By October, drought distress was general and spring planting became a hazard. A fall of six inches of rain in November resulted in some planting activity, but following rains did not eventuate and, by December, considerable distress was evident on all soil types. Irrigated crops maintained good condition and were in a sound position. Elsewhere, the lack of planting material posed a serious problem, and the area passed through a critical period in early January when it appeared as though all mills would be reduced to half normal tonnages, and in some cases, perhaps insufficient for even a reduced crushing period in 1958. However, a two-inch fall on January 21st was followed by well spaced and soaking rains which persisted into the winter, resulting in a remarkable recovery in all areas.

During mid-July and mid-August of 1957, moderate damage was caused by frost in some localities.

The total precipitation of 56.95 inches for the crop year shows a somewhat similar distribution to the record tonnage year of 1955-56. Both show about one-fifth of the total as falling in the first half of the period, and the remainder was then distributed over February to April.

The 1957 Harvesting Season

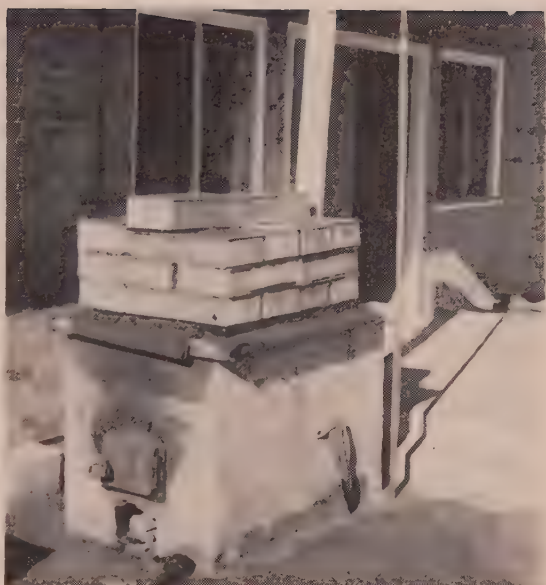
The first of the southern factories to commence operations was Isis Central on 20th June, with Bundaberg mills and Moreton Central during July, and Maryborough and Rocky Point on 28th August. Weather conditions permitted continuous cane supplies, and hold-ups were of little consequence. Total crushing periods were shortened because of the drought and, by November, all mills except Moreton Central had finished.

The cane crushed in the Bundaberg-Isis areas totalled 933,673 tons from 49,190 acres for an average of 18.9 tons per acre. This figure is in contrast to the record year of 1956 with 27.75 tons of cane per acre and 24.1 tons per acre in 1955.

The Growing Season for 1958

Young cane on all non-irrigated lands showed extreme distress during spring, due to dry weather, and some germination failures occurred. Autumn plant cane showed the greatest benefit from the light falls experienced at this time. During July some out-of-season planting took place in an effort to use deteriorating planting material. By October, all non-irrigated district crops were very backward with autumn plant showing premature death of the oldest leaves, and early harvested ratoons no further advanced than those cut eight weeks later.

At the commencement of summer the only harvestable crops in sight were on irrigated farms, and the shortage of 1958 autumn planting material became a major problem. However, good soaking rains stimulated vigour and a remarkable rejuvenation of stools was evident by the end of February. The first evidence of arrowing was



The steam sterilizer (without cover) treating seedling flats before planting cane seed.



The electric strip heaters in the Bundaberg glasshouse.

reported in N.Co.310 ratoons in early April, and by May, fields of this variety were in full flower, with C.P. 29/116 in an advanced stage of flagging. During June heavy crops of arrowed cane lodged following soaking rains accompanied by moderate winds. One of the effects of the drought was the intense quest for water, and boring contractors were fully occupied. The trend in irrigation units is now towards the deep well turbine pump as depths of 220 feet have been reached, although drawing depth is not in excess of 170 feet.

Bulk Sugar Terminal

The bulk terminal at New Bundaberg, which was commenced in March, 1957, will be ready to receive the first of this year's sugar in early July. It is anticipated that the official opening

in September will coincide with the arrival of the first ship for loading. The terminal is estimated to cost £1,500,000, and has a storage capacity of 50,000 tons.

Sugar Cane Pests

The first emergence of adult cane beetles was noted after the six inches of rain in November, but flights were not so heavy as in the previous year. Damage due to *trichosterna* and *frenchi* grubs was scattered, and occurred on the sandy forest soils. On the scrub lands, the Childers cane grubs caused somewhat greater damage on elevated situations in the Isis area. The effects of the grubs were accentuated by the droughty conditions, and a population of two or less per stool was often found to have inflicted substantial damage. Fumigation with carbon disulphide was



A trial against margarodes (earth hearts) at South Kalkie. The good cane in the background had received 4 lb. per acre of aldrin before planting.



Applying copper sulphate in the drill on "droopy-top" country at Moore Park.

practised where the economic situation allowed, and this mainly embraced plant cane. The Bureau has always stressed the importance of correct rotational cropping in preventing grub attack, and failure to accept this advice resulted in the establishment of a number of heavy infestations which caused severe damage.

Trials using BHC, aldrin, dieldrin and chlordane were continued from last year and these were laid down with a trend towards incorporating the insecticides in the topsoil. A grub infestation on a sandy ridge at Fairymead Plantation was investigated but the species concerned has not yet been identified. Damage to a small area of sugar cane at Rubyanna was found to be caused by a pasture funnel ant.

The first ratoons from the replicated BHC and aldrin trials at South Kalkie against the *Rhyparida* grubs, showed outstanding responses in ratooning vigour in the treated plots. Further infestations of root-knot nematodes were located at Fairy-

mead, Moore Park, Gooburru and South Kalkie. A varietal resistance trial was planted at Mullett Creek during spring to determine the relative resistance of approved varieties and some of the more promising seedlings to root-knot nematode attack; unfortunately dry weather caused a faulty germination in this trial. Work is being undertaken by an agronomist to ascertain to what extent the nematodes are associated with the occurrence of indifferent and poor ratoons.

At North Isis, larvae of the soldier fly caused a patchy germination in a field. Elsewhere, at Childers and at Bundaberg, the association of soldier fly larvae with poor ratoons emerged as one of the causes for this condition. Trials with various insecticides, nematicides and sterilants were continued in areas where poor ratooning was likely to develop.

Sugar Cane Diseases

Only one stool diseased with downy mildew

was rogued from the one infected farm in the area. The field is to be destroyed after harvest this year.

There has been an improvement in the mosaic situation due to the destruction of certain heavily diseased fields, the close inspection of susceptible varieties, and the careful selection of planting material. As a provision against ratoon stunting disease, hot water treated stocks of all approved varieties are being maintained by the Cane Pest and Disease Control Boards. In addition, the restrictions on the ratooning of untreated fields should hasten the eradication of this disease.

The incidence of chlorotic streak is confined to the more poorly drained soils, and no new localities of infection have been found. Selection of clean planting material in the Fairdale area resulted in no disease being found in the plant cane crop,

although this area could be regarded as chlorotic streak-prone country.

There has been a general infection of sooty mould in all varieties, but particularly with Q.61. The condition can undoubtedly be related to the presence of above normal populations of sugarcane leafhoppers and aphids which continued into the winter months.

Distribution of a New Variety

A distribution from disease free stocks of Q.70 (P.O.J. 2878 x H.31-2484) was made during August, and 280 tons were allocated to 309 applicants. The variety is a non-arrowing type which prefers adequate winter soil moisture. It is, therefore, most suited to alluvial or irrigated soil types where it should prove a valuable addition to the range of approved canes which mature in mid-season.



Measuring the effects of Soldier fly larvae on cane setts.

Annual Rainfall since 1915 at The Experiment Station—Bundaberg

Year	Rainfall Inches	Year	Rainfall Inches
1915-16	28.54	1936-37	31.65
1916-17	58.08	1937-38	44.40
1917-18	49.85	1938-39	41.01
1918-19	24.24	1939-40	41.69
1919-20	28.20	1940-41	43.26
1920-21	45.16	1941-42	33.52
1921-22	44.97	1942-43	40.75
1922-23	37.14	1943-44	45.22
1923-24	34.16	1944-45	28.14
1924-25	50.96	1945-46	26.10
1925-26	37.62	1946-47	44.52
1926-27	68.18	1947-48	57.76
1927-28	74.69	1948-49	40.18
1928-29	31.16	1949-50	59.31
1929-30	43.16	1950-51	50.74
1930-31	47.19	1951-52	40.42
1931-32	22.88	1952-53	48.99
1932-33	36.81	1953-54	45.81
1933-34	71.45	1954-55	73.95
1934-35	40.01	1955-56	71.13
1935-36	44.24	1956-57	28.01
		1957-58	56.95

Average for 43 years—44.47.

EXPERIMENT STATION ACTIVITIES

New Building

On the night of 11th September, the wooden building which included the garages, machine shop and crushing room was destroyed by fire. A replacement structure of brick was commenced in January, 1958, and completed in May.

Plant Introduction

Canes introduced from the Bureau quarantine at Brisbane and planted on the Station were, B.37-172, B.43-62, B.47-258, B.47-380, B.49-311, C.P.48-103, G.107, H.38-2915, H.46-919, H.47-3756, M.11-43, M.31-45, Mol.894, Mol.914, P.B.52-1-7, P.R.980, R.386, R.397, R.447, U.S.52-9, 50 B.N.7727, 30 S.N.362, 36 S.N. 3424, 37 S.N. 335 and 38 S.N. 3113. These varieties will be grown for subsequent selection and propagation.

The following were received from the Northern Experiment Station for propagation and later introduction to the Moore Park area:—N.Co.292, N.Co. 293, N.Co. 334, N.Co. 339, and N.Co. 349. Others from the same source, and to be grown for introduction into the Elliott Plot were Otamite, G.362, P.O.J.2747, C.P.36-111, Mol.4972, 28N.G. 251, S.J.16, H.31-1389 and 28 N.G. 201.

Isolation Nursery, Beerwah

Eight "N" series canes and H.39-5803 were

Abstract of Meteorological Observations made at the Southern Sugar Experiment Station, Bundaberg, from 1st July, 1957 to 30th June, 1958.

Month	Rainfall (Inches)	No. of Wet Days	Shade Temperatures						Mean Diurnal Range	Mean Temper- ature 9 a.m.	Mean Per Cent. Relative Humi- dity 9 a.m.
			Maximum			Minimum					
			High	Low	Mean	High	Low	Mean			
1957											
July	2.50	7	77	59	67.83	58	36	45.76	22.07	57.65	74.58
August	1.73	8	80	63	72.27	64	37	49.63	22.64	62.93	77.73
September	..	..	80	70	75.50	64	38	52.42	23.08	68.62	69.19
October	.34	1	91	76	82.14	72	45	61.96	20.18	75.57	70.38
November	6.13	4	91	75	80.89	76	57	68.48	12.41	78.70	69.56
December	1.54	4	91	84	87.42	76	64	69.50	17.92	82.28	64.76
1958											
January	10.71	11	92	77	85.69	73	62	69.32	16.37	81.08	73.08
February	7.98	13	89	76	84.80	77	66	71.16	13.64	80.31	79.96
March	2.89	8	88	76	84.15	73	66	68.95	15.20	79.89	82.94
April	12.85	13	81	74	79.26	73	60	66.47	12.79	74.36	86.74
May	1.39	4	88	74	78.30	70	47	57.43	20.87	70.48	81.67
June	8.99	8	84	69	72.27	67	43	55.88	16.39	63.88	91.35
Totals	56.95	81									



A poor growth area at Bingera where high Soldier fly populations were recorded.

introduced from the replicated yield observational trial on the Station. Other canes for subsequent propagation and trial were Azul, B.45-151, B.47-44, C.P.33-49, C.P.38-34, C.P.50-11, Luna and twenty-four Q.55-series seedlings.

Transfer of Varieties

The following seedling varieties were forwarded to Ingham:—L.46, L.74, L.76, L.77, M.98, 1955 series 3, 14, 19, 42, 50, and 82. Canes sent to the Pathology Farm at Eight Mile Plains were "N" series, 12, 31, 39, 50, and H.39-5803.

Canes sent to other Experiment Stations were:—B.4459, B.46199, B.48123, B.48124, H.36-7913, H.44-3382, H.45-2654, H.47-4635, 47 R.4066, H.48-3166, 50 B.N.7727, 50 B.N.8186 and S. spontaneum Moenti.

Annual Seedling Selection

There were 230 selections from the first year seedling block, all being planted in six sett plots,

and thirty of the top gradings in forty sett plots. Selections were also made in the eighty-seven Q.55-series seedlings, and twenty-four were carried forward into a replicated trial. The replicated ten-sett and forty-sett plots of Q.54-series seedlings were ratooned and will be selected this year.

Replicated Randomised Trial

This trial, containing Q.53-series seedlings, was ratooned; selections will be made this year, and transferred to outside farms. Eight "N" series seedlings and H.39-5803 were chosen for further extensive trials and were planted under irrigated conditions at Alloway to provide stocks for future farm tests.

Reassessment of Some Old Varieties

To judge whether some of the varieties once grown in the area were worthy of reintroduction, three trials have been set out embracing P.O.J.2878, M.1900S., Co.281, Co.290, M.189 (Black Innes),



The morning after the fire at Bundaberg.

Q.813, P.O.J.2725, D.1135 and P.O.J.2714 against the newer varieties, Q.47, Q.49, Q.50, C.P.29-116, N.Co.310, Pindar and Vesta. Result from plant and first ratoon crops on two trials, and plant cane from the other, show that the newer canes are superior in terms of sugar per acre.

Ratooning Trial

Freshly cut stools were treated with various fungicides in an attempt to stimulate and improve ratooning. The treatments were applied during October, and two months later there was no response to any treatment.

BHC Toxicity Trial

This trial is now in its second cycle and a plant crop was harvested in 1957. There has been no indication of any depressing effect on vigour as shown by the yield figures.

Permanent Trash Trial

This trial was commenced in 1933 and is now in the sixth crop cycle of the experiment, first ratoons being harvested in 1957. Originally intended to

determine the benefits of trash conservation, the trial had a potash trial superimposed, during the fifth crop cycle. This action was designed to test the theory that the responses being obtained by conserving trash overseas might be due to the potash contained in the residues—particularly on potash deficient soils.

The yield data indicates that the plant food is essential for satisfactory yields on both trash and no trash areas, and further, wind removal of ash after burning leads to acute depletion of potash with consequent ill-effects on growth.

Arboretum

Twenty-eight different trees have been planted in the paddock once used for stock pasture. Growth has been very satisfactory, and further additions will be made as material becomes available.

Annual Field Day

Approximately 475 visitors attended the Station during early June, 1958 for the Field Day, and

were given the opportunity to inspect and discuss various trials, seedling raising and other investigations work.

The display of machinery and implements created much interest, and this was heightened by a demonstration of aerial spraying on some of the fallow fields.

Laboratory Work

The following is a summary of the cane and water samples analysed during the year:—

Experiment Station and Farm				
Trial	..	..	..	1,187
Farmers' Samples	..	..	..	327
Irrigation waters	..	..	..	128

Summary of Crops grown on Station

					Tons
Seedlings	..	..	..	..	216.975
Q.47	..	..	..	..	80.5625
Q.50	..	..	..	..	55.4125
Q.49	..	..	..	..	40.7375
C.P.29-116	..	..	..	..	28.0125

Vesta	..	..	..	..	19.5
P.O.J.2878	..	..	..	..	15.375
N.Co.310	..	..	..	..	14.7875
Pindar	..	..	..	..	14.7625
Co.290	..	..	..	..	3.325
Mixed	..	..	..	..	23.775
					513.2250
Plant Cane harvested	..	..	..	..	229.3625
Ratoon Cane harvested	..	..	..	..	283.8625
					513.2250
Total Cane harvested for mill	..	..	..	..	502.95
Used for samples and plants	..	..	..	..	10.275
					513.225
Total acreage harvested					26.00 acres
Average tonnage per acre					19.74 tons



The new building which replaced the burnt one.



The largest area cross ever made at Meringa was in 1958.

Division of Plant Breeding

J. H. Buzacott, Senior Plant Breeder

Introduction

Following considerable re-organization during the past three years the work of the Division of Plant Breeding is now showing some pattern, and desirable changes in technique and methods can be introduced where necessary with the confidence engendered by a background of successful experimental work. This experimental work has been designed to improve the cross-pollination technique in order to reduce labour requirements, and to decrease pollen contamination and improve the survival of flowers in solution. It has been designed to test basic methods of cane breeding such as the comparison between bi-parental and polycross methods, as well as methods of selection such as bunch-planting versus single-planting. It has been aimed at solving the question of 2-sett, 4-sett, 10-sett or 30-sett plantings for early selections, and the stage at which replication should be introduced into the selection schedule

has been investigated. This ambitious programme has involved the staff of the division in a great deal of work, but this labour is commencing to show its reward in an emergence of better methods which are being gradually introduced into the routine and, above all, in the appearance on farms of a far greater number of promising varieties than ever before.

Cross-pollination

Following a most unusual wet season during which a break occurred from the first to the 25th March, when rain fell on only seven days, it is not surprising that 1958 was a poor flowering year. Some important parents did not flower at all and others entailed much travelling in order to procure sufficient arrows with which to make the desired crosses. Amongst the important parent canes, of which arrows were virtually unprocureable, were Q.57 and G.362. The season finished with a total of 273 crosses, the first of which was commenced on the 19th May and the last on the 17th June, the shortest cross-pollination period for many years. Of the crosses made, fifteen were part of an experiment in further testing for pollen contamination.

In view of the fact that flowering was not only sparse but also brief, it was feared that seed setting might also be poor. Accordingly a large amount of seed from several large area crosses was packed as an insurance against poor germination. Fortunately, with a few exceptions, germinations have been rather better than normal, certainly better than those experienced in 1957, and our fears in this respect have not been realised.

Seedling Raising

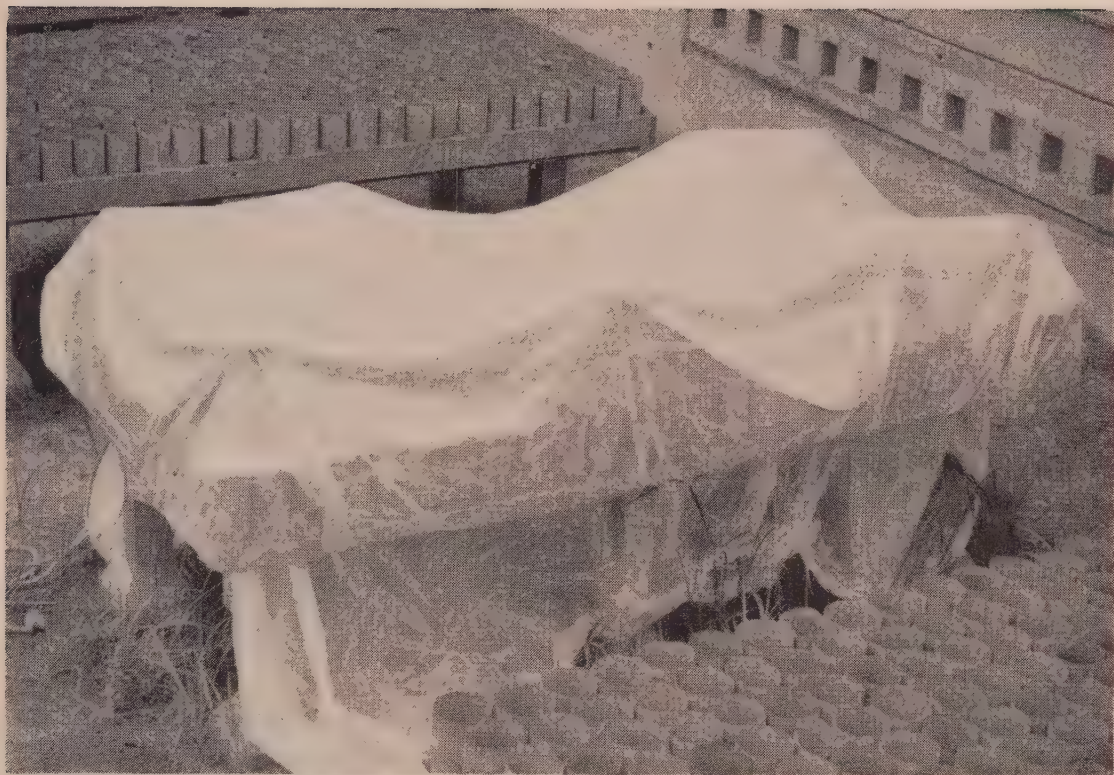
After the wet cross-pollination period of 1957, the germination of seed harvested in that year was rather poor. At the Burdekin Station there was again considerable death of young seedlings due to an unknown cause but at Meringa the growth of seedlings was never more rapid. This coincided with the replacement of leaf mould with mill filter cake as the organic component of

the seedling raising compost. Not only was the growth of seedlings more rapid in the flats but this vigour was maintained when transplanted to pots, and the seedlings were ready for transfer to the field about a fortnight earlier than usual. It is pleasing to note that at the Mackay Station, where filter cake was incorporated in the seedling raising compost for the early 1958 seedling raising campaign, unusually vigorous seedlings were also produced.

At Meringa, 7,694 single-planted seedlings and 2,405 bunches were planted in the field during October, 1957, representing a total field planting of approximately 31,700 seedlings. At the Burdekin Station 5,904 seedlings were planted out at the end of October, whilst at Mackay transplanting to the field was made in late July when 8,382 seedlings were planted. Field planting was done in October at Bundaberg when 5,901 seedlings were planted out, giving a grand total of 51,800



Preparing concrete bays for growing of wild canes.



Methyl bromide sterilization of soil in pots at Meringa.

seedlings planted out at all Stations during the year 1957.

Selection

Selections were made at the Burdekin Station during June, 1957, at Meringa and Mackay during July, and at Bundaberg and the Innisfail and Babinda sub-stations during August. At the Burdekin 136 selections were made from original seedlings and planted in 40-sett plots whilst 22 varieties were selected from the 40-sett plots. At Meringa 770 varieties were selected from single-planted seedlings and planted in 4-sett plots at Meringa and 2-sett plots at Babinda and Innisfail. The best 61 of them were also planted in 30-sett plots at Meringa. Fifty-four of the 1955 series varieties were selected from 4-sett plots and 30-sett plots and either planted for the first time in 30-sett plots or repeated in them. One hundred selections from the 1955 series 2-sett plots were selected and planted in 10-sett plots and 1,412 varieties were selected from the 1956 series bunch-planting and

planted in 2-sett plots. Twenty-one varieties were selected from 30-sett plots and planted in a replicated yield-observation trial.

At the Babinda sub-station 35 varieties were selected from 2-sett plots for planting in 10-sett plots whilst two from the same source were planted in 30-sett plots. Sixteen varieties were selected from 30-sett plots and planted in a yield-observation trial. At the Innisfail sub-station 80 varieties were selected for increase from 2-sett to 10-sett plots and ten varieties from 2-sett to 30-sett plots. Twenty-five varieties were selected from 30-sett plots and planted in a yield-observation trial. It was noteworthy that of the 25 selections at Innisfail and 16 selections at Babinda made from 30-sett plots, which in both sub-stations originated from the same varieties, only one variety was selected in both places. This serves to substantiate the desirability for sub-stations at both Babinda and Innisfail.

At the Central Experiment Station 337 varieties

were selected from 1956 original seedlings and planted in 20-sett plots. Thirty-eight varieties were chosen from the ratoon 1954 series seedlings and planted in a yield-observation trial whilst four rich land selections were made from the same source and planted out. At the Southern Experiment Station the selections from original seedlings numbered 230 which were planted in 6-sett plots. Twenty-four varieties were taken from the 1955 series seedlings and planted in a replicated yield-observation trial. These latter selections were also planted in the Beerwah introduction plot.

Selection Experiments

Investigations into selection methods continued and the comparison between bunch-planting and single-planting methods carried a further stage. Also the programme designed to evaluate the most efficient rate of increase of selections, that is, whether they should be increased by 2-sett, 4-sett, 10-sett or 30-sett plots, was continued. At the present time it seems that grading of first selections is desirable, with the highest grade

selections to be planted in 40 or 30-sett plots and the lower grade to be observed for a further period in 10-sett or 4-sett plots depending on the available land and the number of varieties selected.

Methods of grading varieties have also been explored with a view to attaining some uniformity of grading between different Stations. A method of grading has been developed which gives due allowance not only for yield factors but also for the somewhat intangible appearance factor. Allowance has been made in the grading method for the different methods of payment used by Queensland mills which can cause a difference in the commercial value of a variety in different mill areas.

The substitution of a small plot replicated variety trial for the former yield-observation trial has shown encouraging results and some experiments were planted to test the value of replication at an even earlier stage.

One phase of selection which is being examined is the interchange of first selections with other Stations. In a preliminary experiment first



Portion of the battery of cross pollination lanterns.

selections of 1955 series seedlings at the Burdekin and Mackay Stations were transferred to Meringa and planted with selections from the same series at that Station. In this way a random 2-sett planting was made of 150 Meringa varieties, 144 Burdekin ones and 195 from Mackay. In order to complete the experiment a series of unselected varieties from Meringa was also included and at a later date, when the experiment is selected, comparisons will be made between the number of selections originating from each Station.

A considerable amount of work has been done to justify the replacement of full stalk sucrose determinations with refractometer brix readings in the later stages of selection. Statistical analysis of the figures obtained indicates that, within certain limits, a refractometer sample obtained by puncturing the stalks at three positions, one-quarter, one-half and three-quarter way up the stalk respectively, gives a valid comparison with a full stalk sucrose test. It is anticipated that

much time and work will be saved by the elimination of much of the full stalk analysis formerly done, although sucrose determinations will still be made on a limited scale. Coupled with this work the matter of maturity testing was also given some consideration.

Some simple experiments to obtain an early indication of varietal resistance to lodging were designed but the results of the experiments can only be correlated with lodging resistance of the varieties under tests when they are planted in fields where lodging normally occurs in our present commercial varieties.

Rich Land Varieties

Two lodging-resistant varieties have now attained "Q" status. They are Q.66, produced at the Northern Experiment Station and Q.67 developed at the Burdekin Station. Q.66 is already on the approved variety list for some northern mill areas and it is expected that Q.67



New concrete soil and compost bays at Meringa.



Examining arrows in the wild cane collection at Meringa.

will be approved in 1959. Both have remained erect in areas where all varieties grown previously have lodged badly and both have shown their capacity for producing a reasonable sugar content on rich lands. Some 4,000 tons of Q.66 were milled in 1957, most of it at a c.c.s. comparable with mill average. Apart from these two varieties L.622 in the far north and M.251 in the central district have recently shown some promise for rich land and it now appears that the harvesting of crops on this class of soil will present less of a problem to growers in the future than it has in the immediate past.

Legume Breeding

Seed of the F3 generation of a number of cowpea crosses was despatched to the Burdekin, Central and Southern Experiment Stations for further selection of strains for wilt resistance and, where necessary, bean fly resistance. Families which proved very susceptible to wilt at Meringa were excluded from the plantings. A planting was also made at Meringa but, due to poor soil moisture at the time of planting, an inferior

germination resulted and the same families will be replanted at a later date. It is anticipated that in another three or four generations seed will be homozygous and then selection of desirable types and multiplication of the seed can be proceeded with at each of the Stations.

In conjunction with the wilt resistance breeding project wilt resistance trials incorporating the parent varieties were established. Unfortunately there was considerable variation in the reactions of individual varieties in the replicates and the results are not regarded as a reliable indication of the resistance to wilt or otherwise of the varieties included. Exceptions are C.P.I.12153 and Black Eye No. 5 which have shown considerable resistance to wilt in all trials. A complication is that more than one wilt-inducing organism may be involved as the presence of both *Phytophthora* sp. and *Fusarium* sp. is suspected in legume crops in North Queensland.

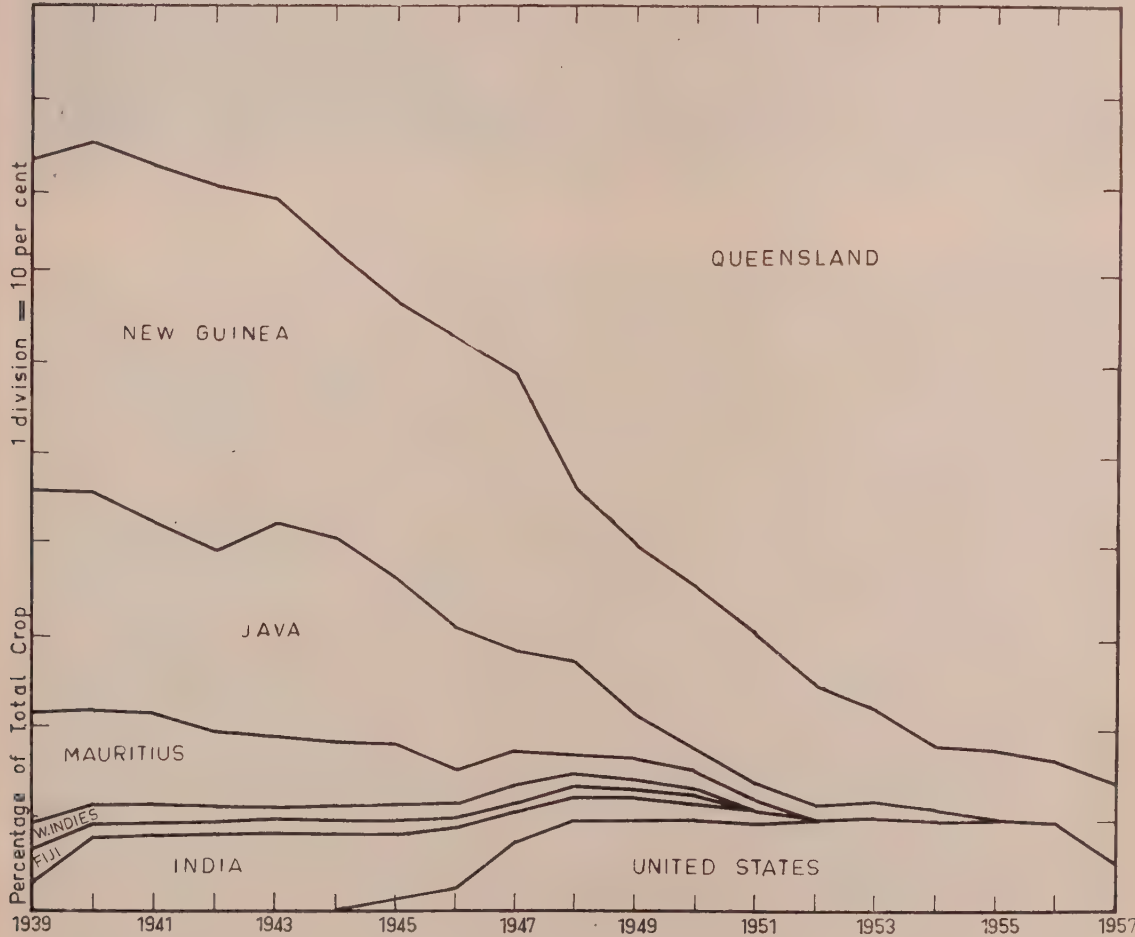
Varietal Statistics

In spite of severe drought in South Queensland

the total State sugar crop in 1957 failed to reach the near nine million ton crop of 1956 by only 32,400 tons. This drought affected the positions of a number of varieties although it did not alter the placings of the three major ones which for four years now have ranked in the order Q.50, Pindar and Trojan.

Q.50, for the fifth time in succession, was the largest contributor to the State's crop although its tonnage was down 200,000 tons on the 1956 figure largely owing to the fact that it is a major cane in Bundaberg and the tonnage of it crushed there was only half that crushed in 1956. Also owing to the reduction in Bundaberg outputs, Pindar challenged Q.50 very closely for pride of place and with a total crop of 2,300,000 tons was less

than 90,000 tons behind Q.50. The struggle between these two varieties has reached an interesting phase. Q.50 is being replaced in the central district to some extent by Q.58 and there are some indications of recession in Pindar following much wind damage over several years in that variety. Since there are record crops anticipated in 1958 for both central and northern districts it remains to be seen whether Q.50 can retain its leading place or not and, if it loses it, whether Pindar or Q.58 will be the first variety to replace it. In the meantime Q.50 and Pindar together produce slightly more than one half of the total State crop with Q.50 down to 75 per cent. of the central district crop and Pindar down to 51 per cent. of the crop north of Townsville.



The composition of the Queensland crop on the basis of country of origin.



Filling drums with solution for cross pollination.

Trojan, whilst remaining in third position increased its percentage of the total crop slightly from 13.6 to 15.5 and was the only other variety to exceed a production of one million tons. This variety is gradually losing ground in the far north largely owing to a weakening in ratoon crops.

C.P.29-116, as a result of the southern drought, was beaten by Badila for fourth place but this displacement is probably only temporary although there are indications of a slight revival in Badila in the far north.

Q.58 made the most spectacular advance of any variety on the list as it moved from ninth position in 1956 to sixth place in 1957, displacing Q.57 to seventh place in the process. From a production of 118,000 tons in 1956 it reached 348,000 tons in 1957 with Q.57 less than 1,000 tons behind it, each representing about 4 per cent. of the total. Q.58 is making a tremendous impression in Mackay and has already reached one quarter of the crop in the Plane Creek mill

area. Since it is proving very popular in the Ingham line district and is expected to be approved very shortly in the southern district the variety cannot fail to be amongst the leaders within the next three years particularly in view of the fact that it is yielding heavier ratoon crops than Q.50 did.

N.Co.310 and Q.44 filled eighth and ninth places, the former being down in tonnage due to the southern drought. No other variety reached the 100,000 ton mark but there were a number of interesting changes amongst the lesser varieties, none of which individually supplied more than one per cent. of the total crop. Vidar improved its position from seventeenth to tenth but is not likely to become a major variety except in one or two far northern mills. Q.47, also because of the southern drought, dropped well down the list from eighth place to thirteenth. Eros, too, fell from tenth to fifteenth position whilst other varieties such as Comus, S.J.16, P.O.J.2878 and Ragnar retained similar ranking to that attained in 1956. Q.59, first listed in 1956, moved on to



Erecting the cross pollination lanterns at Meringa.



Prolific stooling of 1st ratoon Q.58 at Meringa.



Watering freshly planted seedling flats in the Meringa glasshouse.

twentieth place and Luna, listed for the first time in 1957, achieved twenty-first place, both of them already above a number of the older canes such as S.J.4, Cato, Clark's Seedling and E.K.28. Also appearing on the list for the first time are Sirius, Q.61, Q.56, Q.63, Q.66, Q.64, Q.65 and Q.68 ranking in that order, none of which, however, yet exceed .1 per cent. of the total crop. These latter will be dealt with at greater length under new varieties. Of the varieties listed, Q.63, Q.65, Q.66 and Q.68 were harvested as experimental varieties in 1957 since the first three were not approved for general planting until 1958 whilst Q.68 will not become an approved variety until 1959.

Queensland-Bred Canes

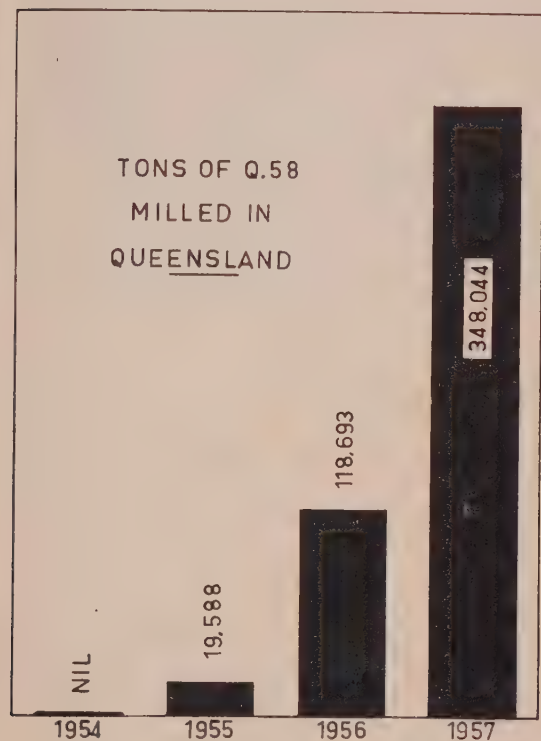
The percentage of Queensland-bred varieties showed a sharp rise in 1957 due mainly to the effect of drought on the yield in the Bundaberg district where the two overseas varieties C.P.29-116 and N.Co. 310 are widely grown. The figure of

85 per cent. achieved in 1957 will fall back slightly in 1958 since a good crop is reported from the southern district and N.Co.310 is also grown now to some extent in Mackay. This anticipated recession will only be temporary, however, because varieties like Q.58 and Q.61, which are gaining impetus in Bundaberg, must soon reduce the amount of C.P.29-116 grown there.

New Varieties

Never before in the Bureau's history has there been promise of so many new varieties for the industry. Q.61 and Q.64 were both approved for the first time in 1957, the former in the south and the latter in the far north. Q.61 is a vigorous variety of the type needed for the Bundaberg district and Q.64 a thicker type of cane which will probably be of restricted use, particularly owing to its undesirable susceptibility to leaf scald disease. No less than four new promising varieties have been approved for growing in 1958 and at least two are scheduled for 1959. Q.66, the most successful variety yet bred for rich land,

has already proved its usefulness in the far north under conditions where no other variety can profitably be grown. Although its disease susceptibility poses a problem in maintaining clean stocks for seed, the variety does not thrive other than on the richest soils and accordingly its disease susceptibility will not cause a serious threat to the disease position in northern areas. In the Burdekin district Q.67 also shows exceptional promise for lodging resistance and is expected to be approved in 1959. Its performance to date in the far north shows that it must prove a valuable supplement to Q.66 for growing on rich lands. Both these varieties have shown a good sugar content and the four thousand tons of Q.66 which were milled in 1957, even though produced on rich land, gave a sugar content comparable with mill average.



Progress of Q.58 since approval.

Following the approval of Q.56 and Q.58 in the central district in recent years, Q.63 and Q.65 have been approved for 1958 and Q.68 is cited

for approval in 1959. Q.63 is already achieving some popularity on account of its exceptionally high sugar content and capacity for high yield. It also germinates rapidly and well and its major disabilities appear to be poor cover and a tendency to sprawl. Q.65 is an attractive variety of a late maturing type with which it is hoped to strengthen the latter end of the crushing season at Mackay. Q.68 has exceptional vigour and is expected to be a purpose variety for sandy soils or those of a very poor nature.

In the southern district Q.70, a vigorous cane of Hawaiian parentage was approved for planting in 1958 and promises to be a useful variety on irrigated farms. This variety could also have become popular in the north but for a tendency to sprawl.

In addition to those varieties which have already attained "Q" numbers there are quite a number of varieties which show promise and undoubtedly some of them will shortly be given "Q" status. Of these L.622 has shown promise as an erect variety for the better lands of the far north. It is also one of the promising varieties in Ingham. At Mackay M.251 has acquitted itself well on rich lands where lodging is usual. This variety is a Badila type; in fact it bears a strong resemblance to that variety, but it does not lodge so easily. I.106 is also likely to be given a "Q" number in the near future on account of its high sugar content and favourable performance on flooded lands at Mackay.

At Bundaberg there are at least two promising varieties in L.76 and M.98 whilst two of the older seedlings, H.25 and H.46, performed so well in the Isis district during the drought that serious consideration will have to be given to their future use as commercial varieties.

Plant Breeding Refresher Course

A plant breeding refresher course conducted at Canberra by the C.S.I.R.O. during August, 1957, for young plant breeders, was attended by the Senior Geneticist. This course consisted of a series of advanced lectures and each participant was required to give a seminar in relation to his own work. This was followed by a symposium on bacterial and viral genetics and a meeting of the Australian Genetics Society.

TABLE VII
COUNTRIES OF ORIGIN 1957 CROP

Country of Origin				Tons of Cane	Per Cent.
Queensland	..	..	..	7,648,247	85.5
New Guinea	..	..	..	613,388	6.9
U.S.A.	..	..	..	470,993	5.3
South Africa	..	..	..	164,203	1.8
Java	..	..	..	44,249	.5
India	..	..	..	3,250	..
Mauritius	..	..	..	1,205	..
West Indies	..	..	..	82	..
				8,945,617	100.0

Table VIII
Varietal Composition and Distribution in the Four Main Districts and in the State as a Whole—1957 Crop

Variety		North of Townsville		Burdekin and Giru		Proserpine and Mackay		Bundaberg and South		Whole State	
		Tons	%	Tons	%	Tons	%	Tons	%	Tons	%
1.	Q.50	155,944	4.1	12,589	1.0	2,019,874	74.8	216,248	18.6	2,404,655	26.9
2.	Pindar	1,971,508	51.5	115,068	9.2	126,497	4.7	102,245	8.8	2,315,318	25.9
3.	Trojan	500,907	13.1	858,290	68.6	26,993	1.0	..	..	1,386,190	15.5
4.	Badila	584,722	15.3	26,641	2.1	2,025	..	..	..	613,388	6.9
5.	C.P.29-116	..	..	..	..	30,790	1.2	440,203	37.9	470,993	5.3
6.	Q.58	..	..	..	..	348,037	12.9	7	..	348,044	3.9
7.	Q.57	154,811	4.0	189,530	15.1	2,802	.1	..	..	347,143	3.9
8.	N.Co.310	..	..	..	..	17,332	.6	146,871	12.6	164,203	1.8
9.	Q.44	103,679	2.7	..	..	..	..	..	..	103,679	1.2
10.	Vidar	91,936	2.4	..	..	..	..	..	..	91,936	1.0
11.	Vesta	..	..	..	..	..	..	83,661	7.2	83,661	.9
12.	Q.28	..	..	..	..	65,917	2.4	4,792	.4	70,709	.8
13.	Q.47	..	..	..	..	..	..	64,531	5.6	64,531	.7
14.	Comus	43,472	1.1	10,443	.8	9,272	.3	..	..	63,187	.7
15.	Eros	62,450	1.6	..	..	..	..	..	..	62,450	.7
16.	Q.55	..	..	..	..	..	..	48,651	4.2	48,651	.5
17.	P.O.J.2878	76	..	..	..	14,838	.6	26,134	2.2	41,048	.5
18.	S.J.16	..	..	37,035	3.0	..	..	..	..	37,035	.4
19.	Ragnar	35,950	.9	..	..	..	..	..	..	35,950	.4
20.	Q.59	29,127	.8	..	..	..	..	..	..	29,127	.3
21.	Luna	22,284	.6	..	..	..	..	..	..	22,284	.3
22.	S.J.4	20,132	.5	..	..	..	..	..	..	20,132	.2
23.	Sirius	14,327	.4	..	..	..	..	..	..	14,327	.2
24.	Q.61	..	..	..	..	..	..	12,437	1.1	12,437	.1
25.	Q.56	..	..	..	..	11,593	.4	..	..	11,593	.1
26.	Cato	10,682	.3	..	..	..	..	..	..	10,682	.1
27.	H.Q.426	7,548	.2	1,719	..	470	..	..	..	9,737	.1
28.	Q.45	..	..	..	..	8,973	.3	..	..	8,973	.1
29.	Q.63	..	..	..	..	6,959	.3	..	..	6,959	.1
30.	Q.49	..	..	..	..	..	..	5,526	.5	5,526	.1
31.	Q.66	4,151	..	32	..	..	..	..	..	4,183	.1
32.	E.K.28	..	..	137	..	3,064	.1	..	..	3,201	..
33.	Q.51	..	..	..	..	..	..	2,860	.2	2,860	..
34.	Q.64	2,707	..	..	..	..	..	..	..	2,707	..
35.	Co.290	..	..	..	..	145	..	2,387	.2	2,532	..
36.	Q.65	..	..	..	..	2,295	..	..	..	2,295	..
37.	Q.68	..	..	..	..	1,483	..	..	..	1,483	..
38.	M.1900	..	..	..	..	1,205	..	..	..	1,205	..
39.	Co.301	..	..	..	..	..	..	718	..	718	..
40.	S.J.2	..	..	374	..	..	..	..	..	374	..
41.	B.208	..	..	82	..	..	..	..	..	82	..
42.	Expt. and Others	12,521	.5	575	.2	1,496	.3	4,882	.5	19,474	.3
		3,828,934	42.8	1,252,515	14.0	2,702,060	30.2	1,162,153	13.0	8,945,662	100.0



The result of Rhyparida dimidiata infestation on a South Kalkie farm at Bundaberg.

Report of the Division of Entomology and Pathology

R. W. Mungomery, Assistant to Director.

Perhaps the item most noteworthy of comment during the 1957-58 season was the remarkable recovery of cane crops in South Queensland following the drought-breaking rains late in January, 1958. With good follow-up rains, even the most optimistic had scarcely dared to anticipate that crops in excess of 50-70 per cent. of the peaks could have been produced in the various mill areas of the Wide Bay and Burnett districts, yet at the commencement of the harvesting season record or near record crops were in sight in some

of these areas. Apart from the unusually good growing conditions in the latter part of the season which, of course, were the main contributing factors, this rapid recovery can also be attributed in a large measure to the high proportion of healthy cane that was being grown, and crop production of this magnitude in the limited growing season would have been virtually impossible had ratoon stunting disease been present to any considerable extent. Therefore if the soundness of the Bureau's policy of inaugurating a hot water treatment campaign to control this disease were ever questioned in South Queensland, this extraordinary district-wide improvement in crop production completely justifies the steps taken to clean up ratoon stunting disease, and equal credit must be given to the growers in implementing this policy so whole-heartedly.

At this stage it might be timely to sound a note of warning that many of the original stocks of hot-water-treated cane are now showing signs of contamination—a happening that was foreseen at the outset—and it would be in the interests of all growers to secure further stocks of clean cane every two or three years in order that future plantings might be made with healthy material. In all cases Cane Pest and Disease Control Boards made ample facilities available for this curative treatment to be carried out.

The co-operation afforded by most growers in respect of disease control is for the most part exemplary, but it is probably inevitable that amongst nearly eight thousand growers there should be a few who are out of step with their fellow growers in matters of this nature. As a result it became necessary to launch two prosecutions during the year—one against a grower for having removed and planted diseased cane, and the other for having transferred cane from one quarantine district to another without a permit. These have been the only two such

cases in the last decade, and it is hoped that the wide publicity given to them will act as a deterrent against similar lapses in the future.

Unfortunately the steady progress that was being made against Fiji disease in the Beenleigh area—its last stronghold in the commercial cane-growing areas of Queensland—was not maintained, and there was a marked increase in this disease during the last season when 133 stools were located on seven farms. The majority of the diseased stools represented primary infection which resulted from planting cane from an unsuspected diseased source. The destruction of the diseased blocks after harvest, in conjunction with the implementation of a programme of regular and close inspections of surrounding fields should soon bring the disease to vanishing point. In the meantime the propagation of a number of susceptible varieties which might be suited to the Beenleigh district has necessarily had to be temporarily deferred.

Because of the previous low incidence of bacterial mottle disease, there developed a tendency to regard this trouble as one of lesser importance; however the heavy infection sustained by some Q.57 plant crops along Cattle Creek and the O'Connell River has served as a timely reminder of the possible losses that might be incurred if a large proportion of these flood plains is planted to susceptible varieties. The high incidence of bacterial mottle in Guinea, Para and other grasses growing along the banks of many of the swift-running coastal streams will necessitate the use of resistant varieties in all areas liable to flooding where this disease is present, for obviously it will not be possible at this stage to get rid of these alternative hosts that are acting as reservoirs of this disease.

Amendments to "The Sugar Experiment Stations Acts, 1900-1957" during the year made provision for the amalgamation or disbandment of Cane Pest and Disease Control Boards, and also for the alteration of boundaries. Following on this, the Invicta Cane Pest and Disease Control Board was consolidated by the amalgamation of the Invicta (South of Townsville) and Invicta (Ingham Line) Boards, while a portion of the previous area of this last-mentioned Board was transferred to the Victoria Board. It is expected



Damage to plant Q.50 by white cockatoos at Conway, Proserpine, 1958.

that this will result in the more efficient functioning of pest and disease control activities within the areas concerned. Provision was also made for the compulsory retirement after one month of members of any Cane Pest and Disease Control Board when they cease to represent the local growers or millers. Perhaps the most important legislative amendment was in the definition of the term "cane pest." This was broadened to include a plant pest which detrimentally affects sugar cane, and as a result the giant sensitive plant has been so declared under these Acts. Authority now exists for Cane Pest and Disease Control Boards to take suitable measures for the control of this noxious weed in their respective mill areas and the amendment legalized a continuation of the work that had been carried out more or less secretly in the past.

The whole question of the control of giant sensitive plant was debated at the Twentieth Conference of Cane Pest and Disease Control Boards held in Bundaberg on 27th March, 1958, when disappointment was expressed that the Co-ordinating Board, which functions under the Department of Lands, had not been sufficiently virile in the past in its campaign of control, and alarm was expressed at the continued spread of the pest. Criticism was also levelled at some Local Authorities for their reluctance to prosecute land-holders who made no effort to control this weed, while the removal of sand and gravel from pits contaminated with seed of the giant sensitive plant was roundly condemned. An approach to the Premier on this matter resulted in a general tightening of control, and it is anticipated that a more aggressive policy will be pursued against this pest in the future. The appointments of representatives from Cane Pest and Disease Control Boards and the Bureau of Sugar Experiment Stations on the Advisory Committee at Innisfail and of another Bureau officer on the Noxious Weeds Committee in Brisbane should go a long way towards establishing the soundness of the Sugar industry's submissions and requirements in connection with this vital matter, and they should be the means of integrating the activities of all organizations engaged in the control of this pest.

Another highlight of the Conference of Cane



Showing the extent of the white cockatoo damage.

Pest and Disease Control Boards was a paper dealing with the spray application of lindane to cane rows for the control of greyback grubs as an alternative to the orthodox method of applying a crude BHC dust. A number of strip trials were laid out in the Burdekin last year to test the relative efficacies of the two forms of control but lack of any substantial grub infestation prevented any comparative assessment. Furthermore if the high degree of grub control which has been characteristic of the past few years is maintained in the future it will render the prior prediction of any likely centres of infestation almost impossible. Hence it appears that this new method of control will develop slowly, since the more conservative growers will be reluctant to abandon a well proved method of controlling greyback grubs by means of BHC dusts until the usage of lindane over a number of years inspires the necessary confidence. However, the lower cost of lindane, which is less than half that of the equivalent quantity of crude BHC dust,

must eventually be an important factor in swinging growers over to the use of lindane, and if it is ultimately adopted on an industry-wide basis the annual saving in the cost of insecticide could amount to approximately £100,000.

Insect pests caused much less damage in the 1958 crop than in the previous year. The most impressive decrease was in the amount of cane destroyed by greyback grubs, which amounted this year to only 468 tons, a record low figure. No doubt this was influenced largely by the extensive use of BHC which rose sharply from an average of 37,674 acres during the previous three years to 47,769 acres for the 1958 crop. Most of this increase occurred in the Burdekin and Mackay districts and it reflected grower reaction to the substantial grub damage that was sustained in these districts in 1957. Frenchi and consobrina grubs caused losses of 1,600 and 200 tons respectively, which are lower than usual, while grubs in the Bundaberg and Isis areas made their presence felt more than usually because drought conditions intensified their effects. However populations for the most part were small and crops recovered after the advent of soaking rains. It is unfortunate that severe infestations have not been encountered in any of the many trials that have been set out in South Queensland on farms that are reputed to suffer grub damage; so even if success were achieved with soil insecticides, the difficulty of predicting likely centres of infestation would surely militate against the wide scale adoption of this form of control, for obviously it would be uneconomic to treat extensive areas when only a very small proportion is liable to occasional damage.

Good progress was made with soil insecticides against grubs of the *Rhyarida* beetle which is one of the agents associated with poor ratooning in Bundaberg, and although harvest results from the first ratoon crop are not yet to hand it is clearly evident that the crop has been adequately pro-

tected by row dressings of either BHC or aldrin. Further links in the life history of this insect must be elucidated before control can be established on a satisfactory basis. The status of other insect pests in relationship to poor ratooning is not yet clearly defined and work against soldier flies and soil micro-fauna is being continued.

Some concern was felt in the Isis district over the heavy incidence of the scale insect on standover crops of C.P.29/116, but it is unlikely that this insect alone was responsible for the low quality of the cane harvested at the commencement of the season. Heavy fertilizing, late growth and intense suckering in a normally late maturing variety were major contributing factors.

Rat damage in the 1957 crop was considerable, the loss of cane being estimated at between 65,000 and 70,000 tons, but very dry weather from August till December had a controlling influence and it was expected that much less damage would have been done to the 1958 crop. However, losses of this magnitude cannot be accepted with equanimity and they warrant further investigational work being carried out on these pests as soon as trained personnel are available.

Wallabies, deprived of natural green feed, invaded cane areas in the Burdekin, causing losses amounting to 1,600 tons, while pigs were active mostly in the far northern areas. Other animals and birds caused minor damage in various environments suited to their modes of life, but white cockatoos descended in flocks on mature fields of Q.50 in the Proserpine area and cut the stalks off about 2 ft. from the ground in patches often over one acre in extent. Indications are that the substitution of resistant varieties may go far towards circumventing this trouble.

More complete details of the entomological and pathological investigational work carried out during the year are given in the individual reports which follow.



A Soldier fly larva has worked into position to feed on a cane root, in a cage.

Entomological Investigations

G. Wilson, Senior Entomologist.

THE GREYBACK CANE BEETLE (*Dermolepida albohirtum*, Waterh)

Greyback beetles emerged in very small numbers in far northern areas. A dry spring delayed emergence until the third week of December, and dry weather in the first two weeks of January would not have favoured the hatching of the eggs. In the Tully district flights appeared to be localised at Riversdale; beetles were in flight over a period of some weeks at South Johnstone, but in small numbers. Since the introduction of BHC has rendered grub control more effective and less dependent on seasonal fluctuations in emergence, progressively less interest is evinced in beetle emergence by those in a position to observe and record it over widely spread cane areas; hence the above positive records do not preclude the possibility of emergences elsewhere. In the Burdekin, where a large area was heavily infested in 1957, beetles flew in only moderate numbers in January, but some concentration was noted at Rita Island, where some farms are not

protected by BHC. No grub damage has been reported, which suggests that the eggs may have been desiccated.

Greyback grub damage in the 1958 crop, 468 tons on 90 affected acres, was the lowest in the Bureau's annual records. Of that total 100 tons were lost on 10 acres at Tully; 68 tons on 20 acres at Inkerman; and 300 tons on 60 acres at Proserpine, where only 80 acres had been treated with BHC.

The area treated with BHC for grub control increased from 37,666 acres in the 1957 crop to 47,769 acres in 1958. In a number of areas, particularly those south of Townsville, grub infestation is sporadic and the area protected by BHC has been inadequate to guard against occasional serious losses. As a result, the Burdekin and Mackay districts were severely hit in 1957, suffering losses of 13,200 and 3,000 tons respectively. An increased use of BHC followed immediately. In Mackay and the adjacent Plane Creek area BHC usage rose from 1,292 acres in the 1957 crop to 3,090 in 1958; in the Burdekin, from 3,473 to 11,850 acres; in the Herbert River district, where the loss due to grubs in 1957 was only 75 tons, there was nevertheless an increase

from 4,990 to 6,359 acres, these growers taking a salutary lesson from the experience of their neighbours in the Burdekin. In the far north, from Tully to Mossman, BHC is more widely and consistently used and the slight decrease from 27,784 acres treated in the 1957 crop to 26,390 in 1958 reflects only the normal year to year variation

Present techniques require that BHC be applied before the extent of the seasonal infestation is known, and must be regarded as an insurance rather than a directly applied control. It is considered that a moderately serious grub infestation in one crop out of ten would justify the consistent use of BHC at the present cost; individual losses can be much greater than is envisaged in that ratio, and it does not take into account indirect loss through poor ratooning or ploughing and replanting of the subsequent crop. A substantial reduction in the cost of protection would have particular importance where grub attack is sporadic; by stimulating a wider, more consistent, use of BHC it would have economic benefits beyond the direct lower cost of application. Great interest attaches, therefore, to a recent development, the spraying of a suspension of lindane in water on the soil, because the present cost of the lindane is less than half that of an equivalent amount of crude BHC dust. In consequence the Bureau set out field strip trials in the Burdekin and Innisfail districts to compare sprayed lindane with BHC dust applications but unfortunately none has so far become grub infested. In pot tests crude BHC dust, a refined BHC containing 60 per cent. gamma BHC, and lindane mixed with soil at various concentrations, all gave comparable time/mortalities of third stage consobrina grubs, and it is concluded that the success of lindane in a spray will depend on its satisfactory distribution in the soil rather than on its chemical formulation. Incidentally, the lower phytotoxicity of lindane to cane roots will undoubtedly be of value in other fields of pest control which involve placing the BHC in proximity to germinating cane setts.

Field trials in which aldrin and dieldrin were being compared against BHC for grub control did not yield any information because of low grub infestations on their sites.

In the long-range investigation of the effect of crude and refined BHC on soil fertility two plant crops were harvested, one at Bundaberg, the other in the Burdekin area. There was no significant difference between the mean yields from treated and untreated soil, nor from the two BHC formulations, nor from different rates of application. This is in accordance with the results obtained in the previous four years. The far northern trial site used in this series, at Babinda, was fallowed and planted again in 1957; the crop is not yet harvested.

Cane beetles with a Two-year Life Cycle

Frenchi beetles (*Lepidiota frenchi*, Blbk.) emerged in the Mulgrave area in the third week of December, and on 5th January. Although the weather had been unusually dry for the five months prior to the heavy rain which released them from the soil, they flew in very large numbers in the Meringa, Highleigh, and Banna sections of the area; few beetles were seen in the southern section of Mulgrave or the adjacent Babinda farms. In the Invicta area beetles emerged at Rollingstone in January. A large emergence took place in Mackay at the Central Sugar Experiment Station, on 3rd January, following heavy rain.

Frenchi grubs reduced the 1958 crop by 1,600 tons, on 170 affected acres. At Mossman 1,200 tons were lost on 110 acres; at Hambleton 340 tons on 45 acres; and some losses at Rollingstone were provisionally assessed at 60 tons on 15 acres. Although the Mackay district has suffered quite severely in some past years, no loss was recorded there, making this the fifth year in succession during which the species has been quiescent. At Mulgrave, no crop reduction could be detected visually but bandicoots (*Parameles* spp.) dug under many stools of cane in fields where frenchi grubs have previously occurred. As these animals have an uncanny instinct for distinguishing between grub-infested and non-infested sections of fields it is suspected that grubs of this species had been present.

While it is generally accepted that a heavier dressing of BHC is required to control frenchi grubs than the 75 lb. of 20 per cent. dust that gives a three-year control of greyback grubs, circumstances have prevented a conclusion being reached concerning the amount required. Field

trials are being conducted in which 20 per cent. crude BHC dust has been applied at 75, 90, 105 and 120 lb. per acre. Current trials are in the plant crop stage, and the absence of grub infestation this year is regarded favourably as it is preferable to have undamaged stools right up to the critical second ratoon crop. Protection of the plant crop requires that the BHC be placed just above the setts at planting time, in an intermediate position in the covering soil. This placement is being adopted by only a small proportion of growers because of groundless fears that the BHC will adversely affect the germination. If the use of lindane in a spray, referred to earlier, proves successful for grub control the growers' fears regarding phytotoxicity can be more easily overcome, and the spray will have advantages over the dust for accurate placement, as well as being lower in cost. The late emergence of beetles, and a continuance of moist warm conditions in early winter, resulted in second stage

frenchi grubs remaining in the top soil until late in June. Second stage grubs gnawed the roots and primary shoots of unprotected, germinating cane plants—an unusual occurrence—and benefit was derived from BHC applied at planting time.

Grubs of *Lepidiota consobrina*, Gir. commenced their attack in a nine acre field of young ratoons in the Hambledon area in October. By January the entire field was badly damaged and was ploughed out with an estimated loss of 200 tons of cane. At Babinda beetles of *Lepidiota caudata*, Blkb. emerged in September without the stimulus of rain and in rather dry conditions. A few larvae were found in a canefield, but no loss of crop was detected. Grubs of *Pseudoholophylla furfuracea* Burm. and *Lepidiota trichosterna* Lea caused more damage than usual in the Isis and Bundaberg districts respectively, and this was undoubtedly heightened by the dry weather before Christmas when small populations were able to have a profound effect on the young cane. A



First ratoon *Badila* damaged by third stage *consobrina* grubs at Pine Creek, Cairns. in October, 1957. The block had to be ploughed out in January, 1958.

total of 19 trials was laid out in these areas against both species, using various rates and methods of application of such soil insecticides as BHC, aldrin, dieldrin and chlordane. Another species of white grub, tentatively identified as *Lepidiota grata* Blkb, was found damaging cane on sandy soil on a portion of Fairymead plantation near Bundaberg, but it is unlikely that it will ever assume major importance.

THE MOSSMAN CANE BEETLE

Grubs that have been causing serious damage in cane at Mossman, even where BHC has been used, could not be distinguished in the field from the larvae of the two-year consobrina beetle, but differed in completing their life cycle in one year. The adults do, however, differ perceptibly from true consobrina beetles and it is expected that taxonomists to whom specimens have been sent will name them as a separate species. They have been given the common name of "the Mossman beetle" because of their prevalence and economic importance in that area, but the species has been found in small areas of cane at Smithfield, near Cairns, and beetles collected at Kuranda some thirty years ago appear to be identical. These grubs destroyed 1,250 tons of cane in 1958 on 80 affected acres, in the Mossman area.

In a trial conducted against these grubs 20 per cent. BHC was applied on the plant crop at 75, 90, 105 and 120 lb. per acre, in the half-open drill and duplicates of the 75 and 90 lb. plots were given additional dressings of 45 lb. and 30 lb. per acre respectively in the first ratoons. In the first ratoon crop untreated control plots gave a mean yield of 34.8 tons of cane per acre. The mean yield from all plots treated with BHC was 39.1 tons per acre, the increase due to BHC, 4.3 tons per acre, being significant at the one per cent. level. No significant difference resulted from the progressively heavier dressings in the plant crop, nor from the ratoon re-treatments. The grub infestation, assessed in the untreated plots, was moderate, averaging 3.5 grubs per stool, a considerable decline from the plant crop infestation which averaged 17 grubs per stool at the comparable time of year.

The Mossman area provided further interest when two hitherto unrecorded species of grubs

were found at Yule Point under badly damaged cane in a field on which no BHC had been used. Grubs of one species were much more numerous than of the other; specimens of the former, bred in the laboratory, are now emerging as beetles (July, 1958) which appear identical with others collected in flight in August and September 1957, near Port Douglas, and apparently similar beetles were caught in October at Freshwater. The species found in the minority has not yet emerged; similar grubs to these were found under cane near Palm Beach, some twenty miles to the south.

ALTERNATIVE SOIL INSECTICIDES FOR GRUB CONTROL

Aldrin, dieldrin, thiodan, and BHC were screened against third stage of *L. consobrina* and *P. furfuracea* in laboratory tests. The insecticides were used at concentrations of 4, 8, 16 and 32 parts of active ingredient per million of air-dry soil against the consobrina grubs; the lowest concentration was omitted with the furfuracea grubs because only a limited number was available. Aldrin, dieldrin, and thiodan were decidedly inferior to BHC; the last mentioned caused complete mortality of consobrina grubs in seven weeks at all concentrations, but complete mortality resulted in aldrin only at the highest concentration in 19 weeks, and at the highest concentration of dieldrin in 33 weeks; BHC gave complete mortality of furfuracea grubs in five weeks at all concentrations, but in regard to the other insecticides the highest mortality attained by the 31st week was 77 per cent. with aldrin at 8 and 32 ppm. Thiodan was inferior to aldrin and dieldrin, but did cause some mortality.

THE FUNNEL ANT (*Aphaenogaster pythia*, Forel)

The funnel ant, which is known to infest some hundreds of acres of cane land in the Tully and Mossman areas, was found this year on five farms at Meerawa in the Mulgrave area. A grower at Riversdale, near Tully, considered that the infestation had spread from a small patch when the land was first cleared six years ago, to its present extent of seven acres. In a field trial in which aldrin and gamma BHC at 4 lb. per acre had been disced in with the seed of the prior legume crop, or applied in the half-open drill

at 2 and 4 lb. per acre, the yields in the first ratoon crop showed only negligible differences between the two methods of application. The mean yields from aldrin at 2 and 4 lb. per acre, and gamma BHC at these rates, irrespective of the methods of application, were, respectively, 28.6, 29.9, 31.9 and 31.1 tons of cane per acre; the mean yield from untreated plots was 26.7. The variance for treatments as a whole was not significant, but the increases due to BHC at either rate, of 5.2 and 4.4 tons per acre, did exceed the formal difference necessary for significance at the five per cent. level. Although these insecticides, and others, mixed with soil in cage tests have caused complete mortality of ants within a few days, none of the field treatments reduced the density of the populations in the cane to any observable extent. Further field trials are being conducted, using aldrin and lindane with some modification of the methods of application. In repellency tests with insecticides at concentrations of 2, 8 and 24 parts per million of air-dry soil, gamma BHC as crude BHC was highly repellent; aldrin, dieldrin, and thiodan were repellent only at the highest concentration; chlordane and lindane had no repellent effect.

As an alternative to soil applications, insecticides are being tested in poison baits. The ants feed readily on 60 per cent. sugar solution, or on a 50 per cent. dilution of table syrup, when mixed with either bran or sawdust, and with or without the addition of sodium benzoate. Diluted black molasses was not readily accepted. When insecticides in normal concentrations were added to the sugar solution, sodium arsenite, chlordane, lindane and dieldrin all gave unsatisfactory mortalities over an eight day period whereas parathion and diazinon were much more promising. Because of the superior persistence of diazinon when set out in a bait in the field, it is proposed to extend the scope of the investigations with this insecticide.

Sexual forms, mature and immature, were particularly numerous from March to June. In June the males, usually lethargic, were rather active and some flew up to cane stalks when disturbed from the soil, but during three nights' exposure a light trap caught only one female.

Two small infestations of the southern species

of funnel ant, *A. longiceps*, Sm., were found at Bundaberg.

SOLDIER FLY

(*Chiromyza rubriceps*, Macquart)

The poor growth caused by soldier fly larvae feeding on cane roots at Bundaberg forms but one aspect of the poor ratooning problem in that district, and their control would simplify the investigation into more obscure causes. It is estimated that a reduction in yield of from seven to ten tons per acre occurred on small patchy infestations in the Bundaberg district, and larvae damaged setts planted in the spring in the Isis district, causing patchy germination. Emergence commenced in the field at Bundaberg in May and continued for about five days. Eggs hatched in ten days. Caged females died usually within a few hours of ovipositing, or on the following day; males survived from two to four days. The duration of the adult stage may have been influenced by caging without food, but almost continuous observation in the field did not disclose any feeding habit. A meticulous examination of the soil disclosed that the larvae may be much more numerous than was at first thought, and may number several hundred in a three-foot length of cane row. Some mechanical aid such as washing or dry sieving would be necessary for making any appreciable number of population counts.

The injection of a water extract of the macerated bodies of soldier fly larvae adversely affected the germination and growth of cane setts during a period of four weeks. The initial extract was obtained by macerating about 1,000 larvae in 15 ml. of water with a pestle and mortar and separating the liquid by squeezing through voile. Some of the liquid was injected undiluted, and the remainder after it had been diluted to half, and a quarter, of its original strength. Controls comprised untreated setts and setts injected with distilled water. Injections were approximately 0.6 ml. per sett. The variety used was Q.50, the setts being three inches long, with one bud. Fifteen setts were used in each treatment, and all were planted in flats of soil. The numbers of buds that germinated, the mean lengths and weights of the primary shoots, and the mean

weights of roots per sett, after four weeks' growth, are shown in the Table.

Aldrin, dieldrin, chlordane and BHC were applied to the soil in a field trial on an infested field in Mackay, but the infestation did not persist

THE EFFECT OF INJECTING AN AQUEOUS EXTRACT OF SOLDIER FLY LARVAE INTO THE CUT ENDS OF FIFTEEN SINGLE-BUD CANE SETTS

Measurements made four weeks after planting

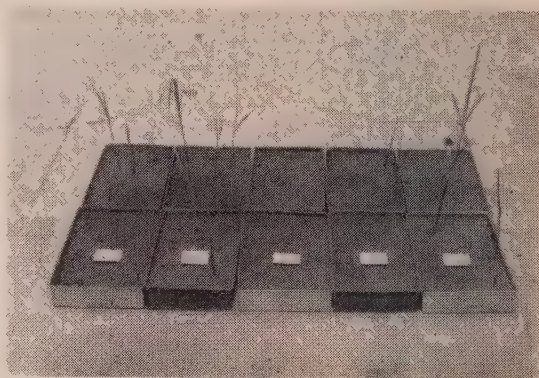
Treatment	Number of setts germinated	Mean length of shoots (cms.)	Mean weight of shoots (g.)	Mean weight of roots (g.)
Undiluted extract	0	0	0	0.3
Half-strength extract	4	9.4	1.3	0.4
Quarter-strength extract	10	27.7	2.9	1.3
Distilled water	12	38.1	4.6	1.5
Untreated	8	33.3	2.4	0.9

The setts injected with distilled water germinated better and grew more rapidly than the untreated setts, and the former must be regarded as the standard for comparison with those injected with the extract. The undiluted extract completely inhibited germination of the buds and drastically reduced the growth of roots. The adverse effects became progressively less when the extract was diluted to half and quarter strengths.

EARTH PEARLS (*Margarodidae*)

Earth pearls submitted to the Commonwealth Institute of Entomology for identification were assigned to two species. *Eumargarodes laingi*, Jakubski, was recorded from Bundaberg, Mackay and Babinda, and a new genus and species was recorded from Mackay, Tully, Babinda and Gordonvale. The adult females of the new species are white, creamy or orange coloured and bear many spines on the body; and in all stages two pairs of thoracic and six pairs of very small abdominal spiracles are present. Adult females of *E. laingi* are pink in colour, bear no spines, and in all stages there are two pairs of thoracic, and three pairs of abdominal, spiracles, all of similar size. In the laboratory *E. laingi* uniformly developed from the egg to the adult in one year; the females emerged fully from the cysts before ovipositing. In the new species some developed from the egg to the adult in one year, while others are still encysted after twenty months; some laid eggs within the cysts, while others emerged before ovipositing.

in any appreciable number, and no significant difference between yields from the various treatments was obtained. Soil insecticides are being screened in laboratory pot tests seeded by means of gravid females or mobile larvae. These tests are not yet complete.



The flat experiment designed to test the effect of inoculating cane setts with an extract from Soldier fly larvae.

SOIL MICRO-FAUNA

As part of the investigation into poor ratooning in the Bundaberg district soil samples taken from amongst normally growing cane and poor cane on five farms were examined for micro-fauna, in July, September, and January. Samples had been examined on two previous occasions, in January and May of 1957. Soil fauna counts did not show consistent differences in the numbers

of any particular species from normal and poor ratooning areas and the species present were mainly the same.

Determinations were received from the Commonwealth Institute of Entomology on a further five of the Acarinae submitted from Gordonvale. The determinations are:—

Nanorchestidae—*Nanorchestes* sp.

Laelaptidae—*Hypoaspis* (*Gaeolaelaps*)
sp.?' *queenslandicus*, Wom.

Rhodocaridae—*Gamasiphis* sp.

Uropidae—Gen. et sp. indet.

Tydeidae—*Coccotydeus* sp.

The plant crops were harvested of two trials in which aldrin, dieldrin, chlordane and BHC had been applied in the drill at planting time, in the absence of any recognised insect pest. No significant difference was obtained between the mean yields from the various treatments and untreated controls.

MISCELLANEOUS INSECTS

Larvae of the Chrysomelid, *Rhyparida dimidiata*, Baly attacked young ratoon shoots and reduced yields at Bundaberg, but on only small areas. In a field trial gamma BHC, as crude BHC dust, was applied at rates of 2, 4 and 8 lb. per acre broadcast, half of these amounts being applied before the final ploughing and the remainder prior to a subsequent discing, and at rates of 1, 2 and 4 lb. per acre above the lightly protected setts in the drill at planting time, before full soil cover was applied. Aldrin was similarly applied at 4 lb. per acre broadcast and 2 lb. per acre in the drill. The plant crop was not affected by the larvae, but the beneficial effects of the insecticides became strikingly apparent when the field was ratooned. The very large differences due to the treatments, and between rates of application, that were evident in the young cane tended to diminish, but were still very obvious, as the crop approached maturity. The yield data are awaited with interest.

In 1957 the beetle borer, *Rhabdoscelus obscurus*, Boisd., infested a high proportion of cane stalks in the Garradunga area at Innisfail. The loss of cane was estimated at 560 tons, to which must be added penalty cutting rates and a reduction of sugar content. Thin-stalked varieties broke two to three feet above the ground and from a

distance bore a deceptive resemblance to rat-damaged cane. Cane debris had accumulated in some fields but unusually hot dry conditions had desiccated it and prevented the breeding of borers, so it was not possible at that time to demonstrate to the growers concerned that the infestation could have been built up through the previous moist years by poor field sanitation. Following that dry weather, the infestation in the 1958 crop was at a much lower intensity. Grubs of the Christmas beetle, *Anoplognathus boisduvali*, Boisd., attacked primary shoots and roots of germinating setts in heavy soil on a few fields near Mourilyan township. At Beenleigh a black beetle, *Heteronychus sanctae-helenae* Blanch. gnawed the primary shoots of young cane and caused severe localized damage on previous paspalum pastures that had recently been brought under cultivation for cane; another black beetle, *Metanastes vulgivagus* Olliff. was involved with the mole cricket, *Gryllotalpa africana* Beauv., and other minor pests in similar damage in the Maryborough and Mackay districts. The army worm *Laphygma exempta*, Wlk., infested 70 acres of cane at Hambleton in November, but spraying with DDT proved a rapid and effective control. Army worms, which were not identified, became numerous on cane that had been silted by floods at Mackay and at Proserpine, but the flood had rendered most of that cane unharvestable. The giant termite, *Mastotermes darwiniensis*, Frogg., destroyed 80 tons of cane on 30 acres in the Burdekin area, and a species, not identified, caused minor damage on two acres at Hambleton. In the Isis district the dry conditions that prevailed until the end of January, 1958, encouraged the development of heavy infestations of the scale insect, *Aulacaspis madiunensis* Zehnt. on standover crops of the variety C.P.29/116. The planting of infested setts has no doubt influenced the spread of this pest in the past, but there is evidence that young crawlers may be wind borne, thus complicating the problem of ensuring a source of clean plants. In some instances a white oil treatment is being carried out at planting time in conjunction with the normal dipping or spraying with an organic mercurial fungicide for the control of pineapple disease. The reaction of this pest to other standover varieties is also being investigated.

ANIMAL AND BIRD PESTS

Some of the animal pests were more active due to an unusually dry hot spring and early summer. In the 1957 crop, rats caused serious damage, destroying from 65,000 to 70,000 tons of cane. All central and northern mill areas suffered losses, but these were greatest in the Herbert River district amounting to 23,600 tons. The damage at Plane Creek was 15,000 tons and at Mackay, 10,000 tons. These high losses, particularly at Plane Creek and Mackay, were brought about by fields being written off as unharvestable. In some harvested fields rats gnawed the young ratooning shoots, even burrowing into the soil for them. The dry weather, however, as was expected, exerted a strong controlling influence and the incidence of rat damage is very much less in the 1958 crop now being harvested. At Tully an unusual type of rat bite was caused by a giant naked-tailed climbing rat, *Uromys caudimaculatus*, Krefft. Caged rats inflicted the typical bite seen in the field. The ends of the bite cavity slope outwards



The type of cane damage caused by the striped phalanger. Tooth marks are discernible alongside the damaged section of the stalk.

toward the rind, whereas the common species inflict a bite at right angles to the rind. Small cubes of the cane tissue are removed, squeezed in the mouth to extract the juice, and dropped on the ground. Several of these rats that were given strychnine bait in generous amount were not killed by it.

The dry weather drove the wallabies into the cane in search of green feed, particularly in the low rainfall Burdekin area where they destroyed 1,500 tons of cane on 450 acres; minor losses were recorded elsewhere, including the destruction of 50 tons of cane at Hambleton. The destruction wrought by pigs ranged from small patches involving a few tons of cane to the trampling down of almost entire fields. The only reliable counter

The striped phalanger.

measure is fencing with pig wire where practicable. At Babinda, the extensive damage that was done in 1957 has been entirely eliminated in 1958 by fencing. A particular type of damage that occurs in cane near rain forest or pandanus swamps in the far north was traced to the Queensland striped phalanger, *Dactylopsila picata*, Thomas. One of these animals was caged and supplied with cane which it ate freely each night, rejecting various table fruits that were offered as alternatives. A nightly feed comprised from two to seven internodes of well grown cane stalks. The rind is partly detached and the inner tissues scooped out in a deep channel. The damage is by no means a rare occurrence and must, in the aggregate, account for several hundred tons of cane.

Birds also took toll of the crop. At Proserpine white cockatoos caused severe damage in limited areas on the borders of forest land, destroying

an estimated 500 tons of cane, and displaying some preference for Q.50. Bald coots were a minor pest in most areas, but the dry weather drove them into the cane fields in the Burdekin area, where they reduced the crop by 500 tons; they were more numerous than usual in Mulgrave, Babinda and Mackay. Usually, they feed on young cane shoots but in the dry weather they remained in canefields until January feeding on the softer high internodes that could be reached from the ground. Damaged stalks died and were replaced by ratoon shoots during the wet season. At Innisfail the shining starling, *Aplonis metallica*, Temminck, perched on cane leaves in the evenings and the foliage collapsed under the weight of their numbers. At Tully the cassowary, *Casuarius casuarius*, Linné, fed on cane bordering rain forest. Photographs were obtained showing the peck marks which characterise the mode of feeding.



Work in the glasshouse is a necessary adjunct to field experiments.

Disease Investigations

C. G. Hughes, Senior Pathologist.

Ratoon Stunting Disease (Virus)

A range of grasses was successfully inoculated with ratoon stunting disease in 1955, as outlined in this Report for 1957. Further tests of infectivity by inoculation of extracts from these grasses into setts of Q.28 were carried out in 1957 and the results are now to hand. Two grasses, blady grass (*Imperata cylindrica* (L.) Beauv.) and Parramatta grass (*Sporobolus capensis* (Willd.) Kunth) were found to be still infected after the two years, but the virus failed to survive in the others. It is possible, of course, that the original sampling removed the aerial portions before the virus had reached the perennial underground parts.

Chemical tests for the detection of ratoon stunting disease in cane stalks, which were developed in Mauritius and United States of America, have been tried and show some promise. However, the colour development is apparently

only sufficiently distinctive where the affected stalk is showing obvious discoloured bundles, and neither test could be used with confidence in the numerous instances where diagnosis by internal symptoms is difficult.

Four trials in which the thick and thin setts of a range of varieties were segregated and subjected to various time-temperatures combinations in water, did not give clear-cut results. In the Bundaberg and Mackay trials a small proportion of plants remained diseased in a number of the more severe treatments: at Ayr and Meringa all plants treated at 50°C. for three hours, the standard recommended treatment, appear to have been freed from the disease.

Further studies on knife transmission of ratoon stunting have shown that contaminated knives will remain infective for at least four days when stored in the shade. The percentage transmission obtained declined from 100 per cent. on the first day to 14 per cent. on the fourth: there was none on the seventh.

A number of yield trials planted in 1953 and 1954 were carried through the full crop cycle of

plant, first ratoon and second ratoon, and the results have further confirmed the serious losses which ratoon stunting can cause in commercial canes. Results with nine varieties are set out in the table and they show that, despite the infection which was inevitably spread into the healthy series of plots during harvest, the originally clean material still out-yielded the diseased to a marked degree. The varieties Q.50 and C.P.29/116, which were also included in some of the trials, did not suffer significant losses over the whole cycle, although in some instances single crops showed a marked loss. It is apparent that these varieties are more resistant than the majority of canes currently grown in Queensland.

occur at Mossman, Freshwater near Cairns, Ingham, Giru, Proserpine, Mackay and Sarina, and in some instances is causing severe losses in affected fields. Of the varieties which have been exposed to the disease, Q.57 and Q.66 appear to be the most susceptible, while Trojan is also susceptible, and the disease has been found in Badila, Comus, Eros, N.Co.310, P.O.J.2878, Pindar and Q.45.

The causal agent of the disease has been isolated from elephant grass (*Pennisetum purpureum* Schum.) and para grass (*Brachiaria mutica* (Forsk.) Stapf.) at Sarina and from para and guinea grass (*Panicum maximum* Jacq.) at Mackay, Proserpine and Ingham. Symptoms in these grasses are

CROP-CYCLE LOSSES IN TYPICAL RATOON STUNTING TRIALS

Variety	Trial No.	Series	Plant	First Ratoon	Second Ratoon	Aggregate	Percentage Loss
N.Co.310	895	Healthy	34.7	31.6	34.4	100.7	
		Diseased	28.3	26.8	30.4	85.5	15.1
P.O.J.2878	880	Healthy	30.7	20.7	25.3	76.7	
		Diseased	26.3	18.2	19.8	64.3	16.2
P.O.J.2878	961	Healthy	36.0	38.4	26.3	100.7	
		Diseased	31.7	30.3	19.7	81.7	18.9
Pindar	881	Healthy	25.1	30.6	27.3	83.0	
		Diseased	21.9	25.6	21.6	69.1	16.7
Pindar	934	Healthy	40.6	27.9	38.7	107.2	
		Diseased	35.2	21.3	34.1	90.6	15.5
Pindar	954	Healthy	34.9	27.6	42.0	104.5	
		Diseased	32.2	21.1	34.5	87.8	16.0
Q.47	882	Healthy	37.1	32.8	10.2	80.1	
		Diseased	30.6	24.9	7.1	62.6	21.8
Q.47	957	Healthy	35.1	48.5	19.0	102.6	
		Diseased	31.2	39.9	10.3	81.4	20.7
Q.56	960	Healthy	30.7	22.4	21.0	74.1	
		Diseased	31.0	19.9	16.9	67.8	8.5
Q.57	999	Healthy	38.0	40.2	37.9	116.1	
		Diseased	34.7	35.6	33.5	103.8	10.6
S.J.4	999	Healthy	34.5	42.7	35.6	112.8	
		Diseased	23.6	33.4	30.7	87.7	22.3
Trojan	880	Healthy	37.0	20.4	23.8	81.2	
		Diseased	29.6	18.0	18.4	66.0	18.7
Trojan	887	Healthy	37.6	18.0	19.8	75.4	
		Diseased	33.4	14.6	17.7	65.7	12.9
Trojan	999	Healthy	38.0	45.5	31.4	114.9	
		Diseased	36.5	41.8	27.9	106.2	7.6
Vidar	887	Healthy	39.2	22.4	24.8	86.4	
		Diseased	35.0	17.5	17.6	70.1	18.9
Vidar	934	Healthy	45.5	33.9	37.2	116.6	
		Diseased	43.3	26.2	23.3	92.8	20.4

Bacterial Mottle

The opinion expressed last year in this Report that this new bacterial disease of sugar cane was confined to flooded land has been confirmed during the year, although the disease has been found in fresh localities. It is now known to

characterized by longitudinal stripes and a mottle similar to those occurring in sugar cane. Similar symptoms have been found in blady grass (*Imperata cylindrica* (L.) Beauv.) and in a species of *Paspalidium*, but the bacterium has not yet been isolated from these grasses. Some specimens



A Bureau field officer and a farmer discuss why a sett failed to germinate.

of bacterial mottle in grasses have been taken in situations where it is improbable that cane has ever been grown and where the flood waters have not come into contact upstream with cane, so it is possible that bacterial mottle is essentially a disease of naturally growing grasses rather than cane: it only needs the combination of flooding and susceptible canes to cause infection in commercial cane crops.

In the glasshouse the disease has been induced by inoculation into Martin and Wheatland varieties of grain sorghums, Sweet Sudan, a variety of Sudan grass (*Sorghum sudanense* Stapf.) and two commercial maize hybrids. It has not been found naturally in these hosts.

The causal organism has been submitted to Dr. W. J. Dowson for naming and he has suggested that it might be referred to *Pectobacterium carotovorum* var. *atrosepticum*.

FIJI DISEASE (Virus)

The only Fiji disease found in commercial cane fields in Queensland was in the Rocky Point area, south of Brisbane, where at time of writing inspections have revealed a heavier infection that in previous years owing to an inadvertent use of infected planting material. Actual loss of cane due to the disease is very small but the area is suffering because some of the promising new canes are susceptible to the disease and therefore cannot be released while the disease is still present.

The fire at the Pathology Farm in October, 1957, prevented the planned standing-over of the Fiji disease resistance trials but results from the second-ratoon trial were quite satisfactory. The first-ratoon trial will be carried over and final counts made in the second ratoons. The standing-over of the Fiji trials does cause some delay but it is a virtual guarantee that the trials will be successful: in addition, the delay is of

very little consequence at the present time (except for Rocky Point) because of the elimination of the disease from practically every area in Queensland.

The second ratoon results from the trial planted in 1955 are set out below:—

Variety	Percentage Infected Stools	Variety	Percentage Infected Stools
J.34 ..	0	Q.57 ..	0
L.9 ..	0	Q.63 ..	14
L.40 ..	32	Q.65 ..	5
L.63 ..	26	Standards—	
L.74 ..	49	C.P.29/116 ..	12
L.76 ..	61	H.32-8560 ..	74
L.77 ..	67	M.1900 S. ..	44
L.79 ..	25	P.O.J.2878	28

At least three of the “L” seedlings would suffer serious crop losses should they become infected in the field. The behaviour of the standard varieties was much as expected and the results of the trial can be regarded as reliable.

DOWNY MILDEW
(Sclerospora sacchari, Miy.)

It would appear that the outbreak of downy mildew on a farm in the Bundaberg area, discovered in April, 1956, is well under control. There has been no spread of the disease to other blocks and the only remaining diseased block, which was planted in 1955, yielded only one diseased stool during the 1957-58 inspections. It will be ploughed out after harvest this season.

Although the very dry spring hindered the growth of the interplanted corn and largely prevented it spreading the disease as much as normally, sufficient disease eventually developed in the downy mildew trial at the Pathology Farm and the relative resistance of the canes under test could be satisfactorily assessed. “M” and “N” series seedlings made up the bulk of the trial and showed the expected range of susceptibility from very susceptible to highly resistant. The variety Q.67, which was the only commercial cane included, showed 47 per cent. stalk infection: figures for the standards were K.338, 100 per cent., P.O.J.2878, 22, Trojan, 16, and Vesta, 20,

so it is obvious that Q.67 would suffer serious losses if grown where the disease occurred.

LEAF SCALD
(Xanthomonas albilineans (Ashby) Dowson)

While the careful selection of the sources of plants does minimize losses from leaf-scald disease in North Queensland, where the disease is endemic, the only reliable method of control is by commercially resistant varieties. These have proved difficult to produce in a sufficient range of types and at the present time a number of the more promising newer canes are known to be quite susceptible to the disease. The logical approach to the problem is by investigation of the breeding material available in the hope that certain lines may show themselves to be resistant. The reactions of some 200 canes tested either in Bureau trials or by commercial plantings have been examined and the canes grouped according to their breeding. In addition, new parents of promise, importations and seedlings continue to be included in trials. Results of the latest trial came to hand during summer 1957-58 and are detailed below. The only conclusion which appears warranted from the data at this juncture is that resistance to leaf scald may be conferred by Co.290 and P.O.J.2878, neither of



Intermingling of grass and cane in the tropical areas is one of the reasons for the Bureau's continued interest in alternate hosts of cane diseases.

which canes produce the lodging resistant types required for the better soils of North Queensland. A programme of systematic progeny testing for resistance to scald, super-imposed upon the testing of individual seedlings, offers most hope of success, and should if possible be carried out within reach of the Northern Experiment Station, where the new canes are bred. To that end, a preliminary trial has been set out on a Tableland farm, where commercial cane is not grown, to ascertain whether leaf-scald reactions in that convenient location may be translated into the behaviour on the hot lowlands. It is obviously inadvisable to plant such a trial near commercial cane areas. The Tableland trial has not yet been inoculated but the large one at the Pathology Farm, planted in 1956 and inoculated after harvesting in spring 1957, developed an adequate amount of disease. Results were as follows:—

Percentage Stool Infection	Varieties
0	C.P.34-120, C.P.43-47, Co.270, Co.331, I.P.180, L.43, Sirius.
1--20	C.P.48-103, Co.281, Co.290, Co.419, Co.475, G.362, H.32-3575, I.106, I.P.181, L.620, M.421, 37M.Q.371, P.O.J.2961, Q.28, Q.58, Q.67, Uba Marot, Q.50.
21--60	G.263, G.269, H.231, H.34-3171, I.102, K.646, K.675, K.728, L.622, L.659, L.662, L.703, P.O.J.2875, P.O.J.2883, Q.33, Q.36, Q.59, Q.63, Q.65, Q.1098, 388.N.4305, 398.N.3821, H.Q.426, Trojan.
60	D.209, D.285, G.217, G.323, G.331, I.209, I.421, J.337, J.B.3, K.5, L.423, L.689, L.711, M.336, Q.10, Q.27, Q.31, Q.39, Q.66, S.J.16, Mahona, Oramboo, Q. 44.

The standard varieties, Q.50, H.Q.426, Trojan Mahona, Oramboo and Q.44, reacted normally except that H.Q.426 might have shown more disease, and it could be concluded that any variety showing more than 20 per cent. infection would be liable to suffer losses in commercial plantings.

New Guinea Cane Collecting Expedition

In July, 1957, the last of the canes from the Warner-Grassl New Guinea Expedition were received and, after similar treatment to that given

earlier batches, were transferred to the quarantine plot on Magnetic Island. These brought the total collected by the Expedition to 262, of which 206 have now survived the minimum of twelve month's quarantine. Some 46 canes (chiefly from the Sepik River) did not germinate, while others were rogued when they developed disease. Eight varieties had to be destroyed on account



This machine cuts the stalks into sets and then dips them in mercurial solution before planting and fertilizing them.

of Fiji disease, while two canes were rogued when they showed mosaic-like patterns on the stalk ; in addition, single stools of two varieties showed Fiji, and so were destroyed, and an unknown external fungal infection on young shoots led to the roguing of one stool of another cane. Freckles of several distinct types occurred on the leaves of many varieties but the affected canes were not rogued on that account: superficially, they did not appear to be pathogenic infections. Leaf spots due to known pathogens did not develop at any stage, although pokkah boeng symptoms showed in some canes during the summer.

An intensive insecticide programme using dieldrin and E.605 as a spray, and Metasystox as a spray and a soil treatment, was followed in order to keep the insect population in the plot at a minimum. It did not control stem mites, *Steneotarsonemus bancrofti*, giant termites (*Mastotermes* sp.), linear bugs (*Phaenacantha australica*),

mealybugs (*Saccharicoccus* sp.), or midrib miners (*Cosmopteryx* sp.), but known vectors of cane disease, such as aphids and leaf hoppers, were reduced to a minimum and prevented from breeding. All insects seen were known local fauna except an unidentified soft scale. Its occurrence on cane is a new record and it has been submitted to the British Museum for identification.

Setts from the plot are to be taken this spring for despatch to the United States Department of Agriculture to fill gaps in the plantings made concurrently in quarantine at Washington, and for planting at Bundaberg, Macknade and Meringa. The Queensland plantings will be under close scrutiny for another 12 months during which period they will be sprayed to keep insects to a minimum.

EYE SPOT

(*Helminthosporium sacchari*
(v. Breda de Haan) Butler)

Eye spot was more prevalent than usual in South Queensland during the winters of 1957

and 1958 and the opportunity was taken to assess the relative resistance of commercial varieties.



Varieties in the leaf-scall trial at the Pathology Farm show a wide range of habit.



Inspecting for mosaic disease, Habana, Farleigh.

It was apparent that none of the new canes is more susceptible than Q.50 or P.O.J.2878, which do on occasions show serious loss of photosynthetic tissue, but in general can be grown without any ill-effects from the disease. Q.58, Q.61, Q.68 and Q.70 are apparently as susceptible

small farms in hilly country in the Farleigh area and a campaign has been inaugurated there by the Mackay Cane Pest and Disease Control Board working on lines laid down by the Bureau. These aim at the provision of clean plants and the roguing and limited ratooning of diseased fields. Results of the single season's work indicate every hope of success.

A resistance trial at the Pathology Farm, in which the canes were inoculated by the Sein method, included a range of seedlings and commercial canes. The variety Q.50 showed less disease than expected so that low recordings may not be reliable, but highly susceptible varieties such as Oramboo, Black Innes and Q.42 became heavily diseased and canes under test giving comparable figures must be considered as susceptible. These included the new canes Q.66 and Q.67.

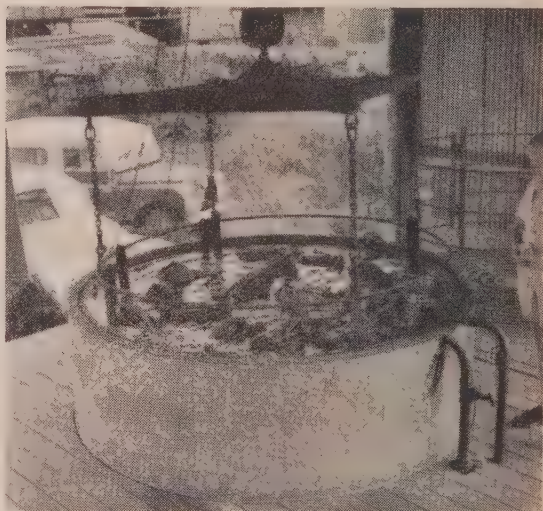


Unloading baskets of treated cane at the Mourilyan hot-water treatment tank.

as Q.50, while Q.28, Q.47, Q.57, Q.59 and Q.64 are comparatively resistant and would not be expected to suffer damage in any season.

Mosaic

Mosaic disease has never presented a problem in the areas north of Townsville, probably due to climatic influences, and susceptible varieties can be grown with impunity even though very occasionally a diseased stool may be found. In areas south of Townsville, however, the disease can become serious if neglected in a susceptible variety. At present it has been reduced to a low ebb on the Lower Burdekin and in the Bundaberg district, but in the Mackay district, where the major variety Q.50 is somewhat susceptible, the disease occurs on a large number of farms. It is potentially dangerous to the Q.50 and is definitely preventing the exploitation of certain newer, quite susceptible seedlings. The worst area of infection occurs in a pocket of



The hot-water treatment tank at Tully.

Pathology Farm

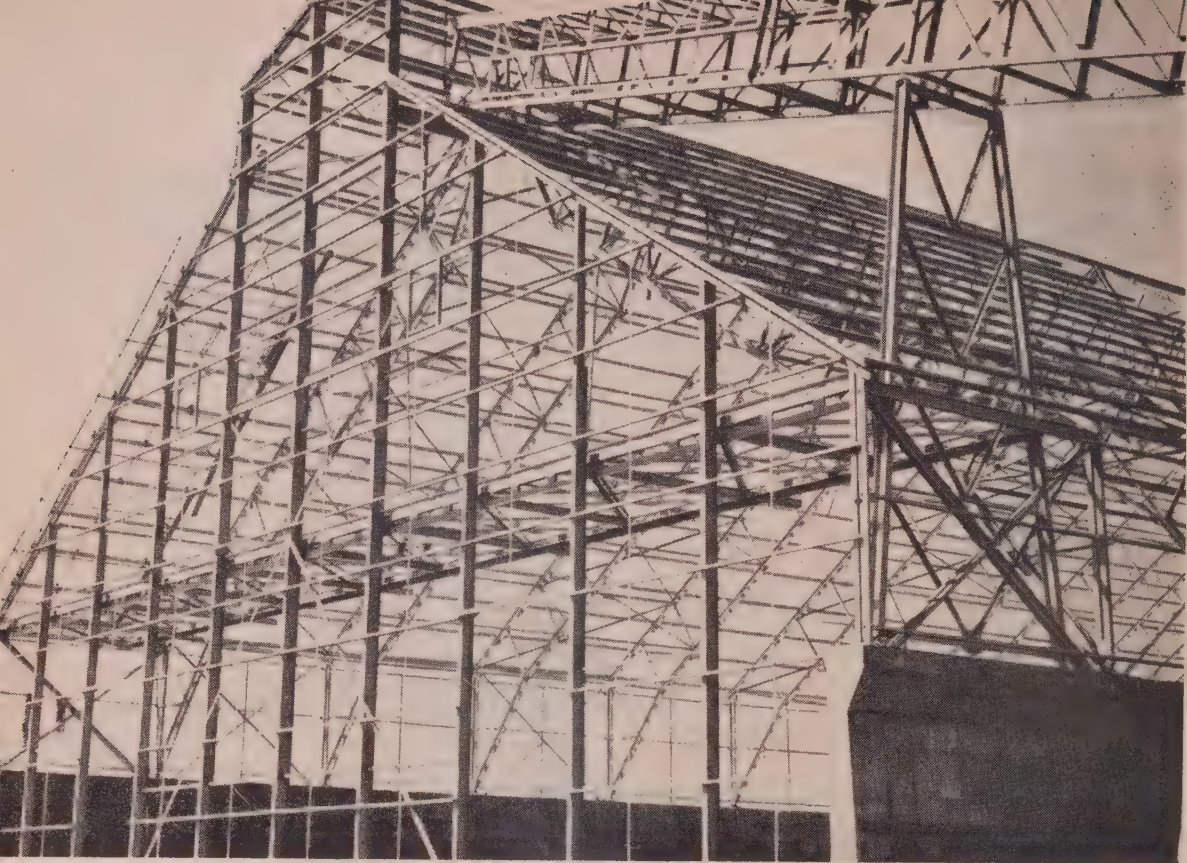
The Pathology Farm suffered some distress from the previous inadequate wet season and dry winter and spring and an accidental fire in October, 1957, was impossible to check in the dry crops. However, there was no loss of property and fortunately all plantings had been made. However, it meant that a Fiji trial could not be stoodover and that late inspections in

the red-rot and ratoon stunting trials were impossible. The protecting belt of timber between the downy mildew trial and the main cultivation area was burnt out, destroying the undergrowth and smaller trees, but inspections to date have not shown any spread of the disease.

Decorative plantings of cotton tree (*Hibiscus tiliaceus*), leopard tree (*Caesalpinia ferrea*), West African tulip (*Spathodea companulata*) and red bottle bush (*Callistemon viminalis*) were made along the Warrigal Road frontage in front of a block planting of slash pine (*Pinus elliotti*).



A flood-liable alluvial flat is ideal for the development of bacterial mottle. Both cane and grass were heavily infected on this Proserpine farm.



Lace-work in steel—the Bundaberg bulk sugar terminal during construction.

Division of Mill Technology

J. H. Nicklin, Chief Technologist (Engineer)

and

L. R. Brain, Senior Mill Technologist

Staff

There was a slight increase in the staff of the Division during the year. Mr. F. Galetto joined the Bureau after completing his University studies and is now Assistant Mill Technologist at Bundaberg. Additions to the Brisbane staff were Mr. R. F. Beale, Assistant Engineer, and Miss E. O'Sullivan, Statistical Clerk. The resignations of Messrs. J. D. Harland, Bundaberg, and J. D. Watson, Brisbane, were accepted.

Laboratory Work

The mills continue to take advantage of the standardization and instrument repair facilities offered by the Bureau. Largely, the apparatus checked is required to be certified under the Central Sugar Cane Prices Acts but it is the

wish of the Bureau that, in the near future, all equipment being used in sugar mill laboratories in Queensland will bear the mark of standardization of this Bureau.

The equipment standardized during the year included 316 brix spindles, 135 flasks, 3 burettes, 69 pipettes, 62 thermometers, 5 sets of weights, 8 quartz plates, and 99 polariscope tubes. In addition, 7 saccharimeters and 12 refractometers were checked for accuracy and, when necessary, overhauled. On the analytical side, 6 samples of molasses and 4 samples of sugars were analysed.

In the near future it is hoped to have a new instrument for checking the length of polariscope tubes to much higher accuracy than previously. The same instrument will also be used for checking the parallelism of the ends of the tubes.

Investigation into the C.C.S. Formula

The main portion of this project for the 1957 season involved the direct analysis of cane at Pleystone mill, carried out by the staff of the Central Sugar Cane Prices Board under the supervision of the Bureau. These officers were trained in Bundaberg and, throughout the season,

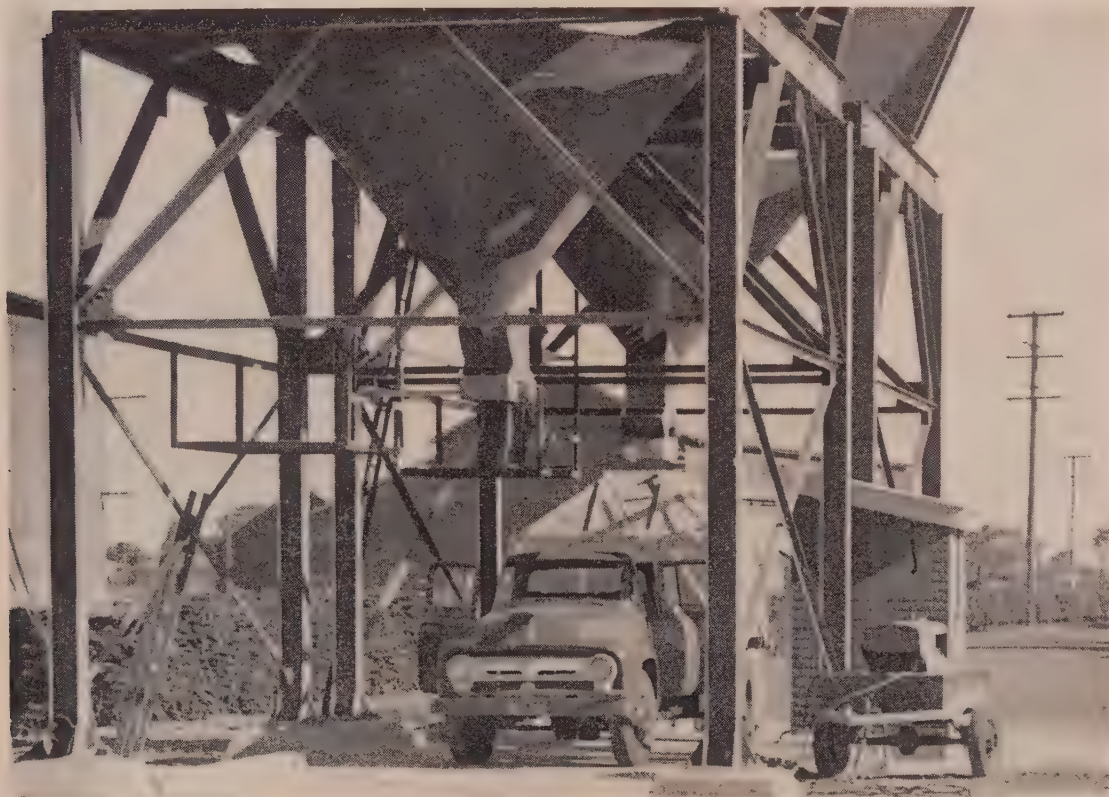
sampled and analysed prepared cane at Pleystowe. The analysis of cane by the wet disintegrator was then compared with that determined by the juice scales and the comparison showed that the former is a very effective method of determining the analysis of cane entering a mill. The results also indicated that the arbitrary 3 and 5 factors were very much in error for Pleystowe mill during the 1957 season, a feature that more than justified the initiation of the whole investigation.

Also included in this work was an attempt to determine whether these formula constants could be related to any obvious factors such as cane variety, soil type, etc. From the short investigation which was carried out in Bundaberg, there did not appear to be any relationship between these factors and the constants. However, a more intensive investigation during the coming year will endeavour to determine how these constants can vary within a given farm or area.

This aspect of the investigation is necessary to determine the value of an individual consignment of cane—the most complex side of the problem.

Further investigations carried out at Farleigh were initiated to ascertain whether the formula constants could be determined at any mill, without undue preparation, over a short period. The work indicated that this could be done quite satisfactorily.

By arrangement, a conference was held with officers of the Colonial Sugar Refining Co. at which the principal subject was the direct analysis of cane by the wet disintegrator. The discussions indicated the necessity for checking the efficiency of extraction of the machine and exhaustive tests showed that the machine designed by the Sugar Research Institute, which was used in all our tests, was adequate, although the margin was very small in some cases. While the normal



The two bulk sugar bins at Bingera; a truck is being loaded for delivery to the terminal.

period for extraction is 45 minutes, a double unit built in our laboratories was effective in extracting the cane in less than 15 minutes and, although not a practical unit, the double unit proved the effectiveness of the original machine.

However, to improve this unit, the original 5 inch blades were replaced by 7 inch ones and it is likely that the extraction time can now be reduced to 30 minutes with safety.

The coming season will see a continuation of the direct analysis of cane at Bingera mill where the cane is not confined to almost one variety as it is at Pleystowe. As indicated already, evaluation of individual consignments will also be considered, although this latter aspect can be expected to be very involved.

Fugal Linings

Following the series of tests on a new type of fugal lining at Fairymead in 1956, it was decided that the linings might show some value in fugals running at a lower speed than that of 1,800 r.p.m. in use at Fairymead. The linings were fitted to a Broadbent fugal at Racecourse mill, running at 1,440 r.p.m., but exhaustive tests failed to show any advantage in their use.

The investigation of these linings, which appeared to be quite promising initially, was therefore concluded, showing no advantage either in decreased molasses purity or in increased capacity of the normal types of fugal to which it might be attached.

Bulk Handling

The outstanding feature of the past year and one of great interest to all engaged in the sugar industry, if not to all Queenslanders, was the inauguration of the bulk handling scheme at Mackay. There were, of course, teething troubles, but for a scheme of such size—the largest in the world—these were relatively few and hearty congratulations must be extended to the planners, designers and builders for the very successful conclusion to their efforts.

The benefits to be obtained from bulk handling were originally expected to come from savings in bag, labour and transport (road, rail and sea) costs. All these benefits were fully realised; as an illustration of the last two it is sufficient to state that the loading of sugar ships at Mackay

is carried out in the same number of days under the new scheme as weeks were required under the old. In addition to these expected benefits, however, the steady disposal of the finished product resulted in a definite increase in the capacity of certain items of factory equipment when the new system came into operation. The chief chemist also found that time previously devoted to the disposal of his product could now be used much more advantageously in the making of it.

Turbine Troubles

Another feature of the past year, but one unfortunately which gives no pleasure to record, is the number of troubles which were experienced with steam turbines. Many of these units are now used in the industry and their popularity had reached the stage that, where a new



The Zeiss Opton refractometer used for calibration work in the Bureau's laboratories.

crushing mill was to be installed or the power of an existing mill increased, the decision to use a turbine for the prime mover was almost automatic. The reason for this is that turbines are cheaper to buy, more easily controlled, and take up much less floor space than slow speed engines of the same power.

The troubles, which were restricted almost entirely to the blading, both fixed and moving, might tend to revise our opinion of turbines; but before they are condemned as unsuitable, however, it is hoped that the real cause of the trouble—wet and impure steam—will be eliminated.

The sugar factories of moderate to large capacity which have been built during recent years in various parts of the world, have all been equipped with boilers which supply superheated steam, and all prime movers have been turbines. It is almost certain that this procedure would be followed if a new factory were to be built in Queensland. While superheated steam is not in itself a cure-all, the fact remains that impure superheated steam is much less troublesome to turbines than impure wet steam, and those few of our factories which were fortunate enough to have superheaters have experienced no

turbine trouble. Although we do not suggest that superheaters should be installed on all boilers, it might be economical under certain circumstances to install them on an isolated group of boilers which could be used for supplying steam to turbines.

All factories should endeavour to produce pure steam and this is particularly important when the steam is wet. Turbine manufacturers do not seem to fear wet steam when it is free from impurities.

Conductivity Control of Condensates

Conductivity control of condensates is practised by a number of overseas factories and as a first step towards obtaining pure steam the method was investigated by the Bureau.

The purity of a condensate may be judged by its electrical conductivity and this may easily be measured. An instrument—a conductivity controller—is also available which may be set



The single bulk sugar bin and elevator installed at Fairymead.

to any particular value of conductivity and will give a warning whenever this value is exceeded. By taking a continuous sample of each condensate which is to be used for feedwater purposes, the instrument could be set to give a warning when any condensate was not of sufficient purity.

Tests with the instrument proved satisfactory and it should be of considerable aid in the production of pure steam. In the ultimate arrangement the warning signal could be used, through a relay, to operate a valve which would automatically divert any impure condensate away from the feedwater tank.

Crushing Rates

Crushing rates were again higher than in the previous year but they must now be approaching the economical limit for the existing sugar peak and, unless some outside disturbance affects the world's sugar industry, it is unlikely that the increases of the last few years will continue after the 1958 season.

Higher crushing rates have no effect on the money earned by the Queensland sugar industry as a whole. They result in a shorter crushing season which would probably increase the profit made by grower and miller to a slight extent and decrease the amount of money paid out for crushing season labour; but the only way in which, under the existing conditions, the revenue of our industry can be increased is by means of by-products.

By-Products

Early this year, in co-operation with Monsanto Chemicals (Aust.) Ltd., the first particle board to be made from Queensland bagasse was produced in Brisbane. These sample boards, with two plain sides, were made by the "dry" process using about 6 per cent. of urea formaldehyde as a binder. The boards are of good appearance and lend themselves to various surface finishes. By veneering with fancy timbers, and this can be done simultaneously with the making of the core, an excellent board for the furniture trade is produced. Tests for strength and other properties which were carried out at the University of Queensland showed that this bagasse hard-board compared quite favourably with commercial hardboards. The manufacturing process involves

no difficulties as regards water supply or effluent disposal and the capital required to establish an annexe plant should be within the reach of most of our sugar factories.

Considerable quantities of bagomolasses (a mixture of molasses and dried screened bagasse plus additives) are used overseas as stock feed. Feeding trials using this material have been carried out at the Animal Research Institute at Yeerongpilly in recent years and to enable these to be continued, particularly with a view to evaluating the use of urea as a cheap source of non-protein nitrogen, a small pilot plant for drying and screening bagasse and then mixing it in the proportions of 70 molasses to 30 bagasse was designed by Bureau officers. The Fairymead Sugar Co. Ltd., fabricated and erected the plant at their factory and to them we are indebted. About 12 tons of bagomolasses were prepared and forwarded to Yeerongpilly for further feeding trials.

The abovementioned uses for surplus bagasse might be regarded as suitable projects for



A new set of juice scales at Bingera.

individual mills. For a district such as Mackay, however, where an enormous quantity of surplus bagasse could be made available each year, the establishment of a central paper factory appears

to be the best way of profitably making use of *all* the surplus.

The extraction of cane wax is another by-product possibility which might be considered by those mills where the wax content of the filter mud is high. Enquiries made by the Bureau during the year showed that the market possibilities for the crude wax are not good but there appears to be a number of wax users who are interested in the much more valuable, hard, refined wax which has been produced in small quantities by the C.S.I.R.O. The Bureau would be only too willing to co-operate with any factory, which is genuinely interested, in the design of a commercial size plant for the production of refined cane wax.

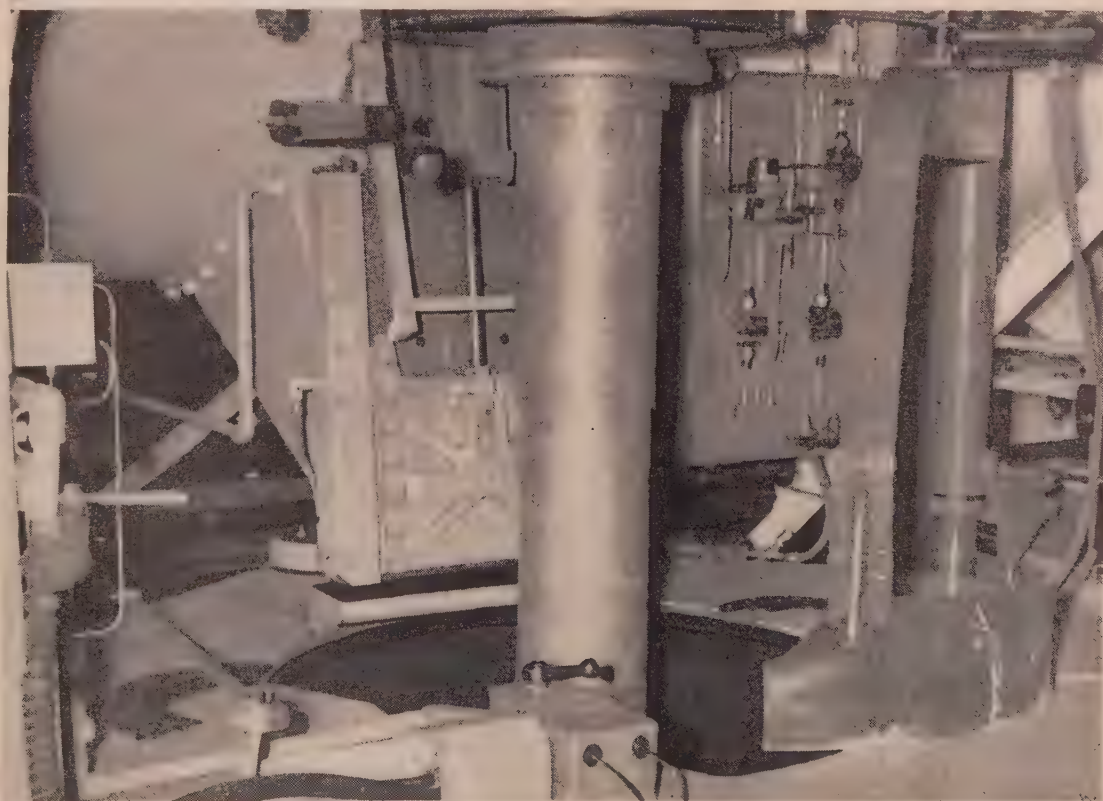
General

Following established practice, each mill was visited by at least one Bureau officer during the

season. Contact with mill staff has been greatly increased since officers have been stationed in the Bundaberg and Northern areas. The service available to mills whereby individual mill problems may be investigated was availed of by several mills during the 1957 season, including Mossman, Mourilyan, Tully and Invicta.

THE 1957 SEASON

While the cane crushed during the 1957 season was slightly less than that crushed in the previous year, the tons of 94 n.t. sugar produced showed a substantial rise. This was a welcome return to low values for cane required per ton of 94 n.t. sugar, a value of 7.12 being recorded for the season. Overall, 8,945,617 tons of cane were handled for a production of 1,256,271 tons of sugar, which is about 4 per cent. greater than the aggregate of mill peaks (1,203,900 tons). The result is gratifying when it is realised that



A view of a new Broadbent fugal at Fairymead,

a disastrous drought ravaged the southern area where only 1,162,153 tons of cane were handled compared with 2,015,122 tons in 1956.

It should be pointed out that a new system has been adopted in reporting the figures for the main areas of the State. Previously, the State was divided into three areas, the central district incorporating the Burdekin and Mackay districts. It had been realised that these two areas are hardly comparable in any way, and a division of this area was decided upon. The Burdekin area now includes the Invicta, Pioneer, Kalamia and Inkerman mill areas while the Mackay area includes Proserpine, Farleigh, Racecourse, Pleystowe, Marian, Cattle Creek, North Eton and Plane Creek mill areas.

The decrease in tons of cane per ton of sugar was due solely to the large rise in the quality of cane milled, since the drop in mill efficiency shows that part of the improvement did not lie in that direction. This effect was apparent in each district, the overall rise in c.c.s. being 0.79. The northern and southern districts exhibited substantial increases in c.c.s. due, no doubt, to the dry weather experienced in those areas.

A very pleasing aspect of the cane supply was the drop in fibre per cent. cane from 13.59 to 13.26. This reduction must have a beneficial effect on milling work and it reflects both the result of a dry crushing season when good burns were secured and more efficient control of cane cleanliness by millers and growers. It is to be hoped that this trend will continue although, with the high fibred canes being processed today, one cannot logically expect much reduction in fibre content of cane received at the mill.

With the installation of more equipment, the crushing rate has continued on its upward trend, the average rate being 109.46 for the State. This increase is reflected in the large decrease in crop days required by the mills, 4,690, compared with 5,605 in 1956. The Northern, Burdekin and Mackay districts all showed increases in crushing rate while the southern district recorded a fall. A return to fully-loaded trucks due to straight cane had a large influence in the former areas while the severe drought conditions in the south certainly would tend to reduce the crushing rate in the latter. The analysis of gross time shows

that lost time, due to manufacturing troubles and cane supply, each fell, the latter to a large extent. The effect of dry weather and straight cane is once more apparent.

Associated with this increase in crushing rate, however, was a decrease in pol extraction from 94.78 in 1956 to 94.51 in 1957. This decrease was found in each district except the south and it appears that, if milling efficiency is to be maintained, more powerful equipment must be installed in this section of the factory. The trend to the elimination of pusher gear in mills is increasing and another interesting development, at least for Queensland, is the use of tall vertical or near-vertical chutes for feeding cane mills. Their use could increase rapidly due to their efficiency and low comparative cost.

The increase in overall efficiency exhibited in 1956 was continued in 1957, the co-efficient of work increasing from 97.20 to 97.49, a similar effect being found in the overall recovery 85.59 to 86.25. The Northern, Burdekin and Mackay areas were credited with substantial rises in efficiency while the southern area showed a decrease. Considered in conjunction with the variations in pol extraction, these results show a marked improvement in the processing departments of the factories in the former three areas while a deterioration is shown in the southern area. Apparently, even with a reduced crushing rate, the effects of drought were still felt throughout the factory.

The attention now being paid to the treatment of low grade massecuites was rewarded by the decrease in purity of final molasses in relation to the expected purity. While the actual purity dropped by only 0.1, the expected purity rose by 0.4, a net gain of 0.5. The loss of pol in molasses per cent. pol in cane also decreased from 6.11 to 5.79.

A significant decrease in undetermined loss was also recorded, 1.80 compared with 2.41 in 1956. However, individual values at various mills were extremely variable and will remain so until an efficient system of factory control is introduced.

The year 1957 is memorable in that the normal payment system for cane was altered in one Mackay mill and a system based on analysis of

cane by juice scales was adopted. By the 1958 season, six mills will have installed juice scales and another will have them installed during the season. We welcome this trend as the Bureau has advocated their use for many years and has pointed out the inadequacy of the present system based on an empirical formula for factory control.

Sugar quality showed a further decline,* the net titre being 96.88, whereas the value was 97.22 in 1956. This is due largely to the increased amount of low polarisation sugar (109,000 tons) made for the Japanese market. The keeping quality of the sugar, as shown by the dilution indicator, has risen in all districts, the average now being 33.

The table for fuels used once more shows the effect of the dry season in the north, Burdekin and Mackay districts and the poor cane supply in the south. Uninterrupted crushing in the former three areas resulted in little extraneous

fuel being used while the intermittent crushing caused by a poor cane supply in the south resulted in a large increase in extraneous fuel. As has been pointed out previously, the overall usage of fuel cannot be regarded as a true indication of fuel requirements as, in areas where the cane has a high fibre, the bagasse is burnt inefficiently to avoid the difficulty in otherwise disposing of it.

Generally, the operations of the factories during 1957 can be regarded with satisfaction. The increased crushing rate, together with a much higher sugar content, is excellent considering that the overall efficiency was also increased. However, the drop in extraction indicates that the milling section of the factory must be improved if the former figure is to be maintained. The increasing number of juice scale installations is very welcome and it appears that in the near future the figures relating to factory control reported in this publication will have a more substantial basis.

Table IX—Production Data for Queensland Mills for Seasons 1951-1957 (Totals and Weighted Averages)

Northern District	1951	1952	1953	1954	1955	1956	1957
Cane—							
Tons	2,135,564	3,092,819	3,315,716	3,943,427	3,270,354	3,197,051	3,699,279
Pol per cent.	15.64	14.84	15.45	13.88	13.55	13.80	14.74
Fibre per cent.	11.26	11.24	11.61	10.93	11.38	11.74	11.21
C.e.s.	14.58	13.70	14.48	12.70	12.36	12.67	13.99
Purity 1st expressed juice	90.08	88.47	89.96	87.20	86.96	87.71	89.11
Sugar—							
Tons 94 net titre	304,786	421,921	467,716	502,276	413,853	406,172	516,345
Cane per ton sugar	7.01	7.40	7.09	7.85	7.90	7.87	7.16
Pol per cent.	98.52	98.66	98.81	98.50	98.60	98.78	98.66
Net titre	97.07	97.33	97.52	97.09	97.33	97.61	97.30
Dilution indicator	28.8	31.3	31.0	30.5	41.0	38.5	36.0
Pol per cent. pol cane	85.39	86.61	85.78	85.17	84.67	86.32	87.69
Mud—							
Tons	38,342	53,197	55,582	63,816	54,285	53,324	57,489
Mud per cent. cane	3.13	2.91	2.95	2.96	3.07	3.19	2.90
Pol per cent.	4.10	4.50	3.55	2.96	3.47	2.40	2.54
Pol per cent. pol cane	0.82	0.90	0.69	0.64	0.79	0.55	0.50
Molasses—							
Gallons (1,000's)	4,950	7,905	7,723	10,246	8,243	7,416	8,001
Gallons per ton cane	4.04	4.32	4.17	4.76	4.66	4.43	4.04
Brix	88.82	88.28	89.87	89.78	91.38	90.29	90.60
Apparent purity	33.78	31.66	33.97	32.49	31.87	30.05	30.76
True purity	45.57	43.36	45.71	44.31	44.40	41.82	42.77
Expected purity	38.36	37.99	38.90	38.0	38.4	37.8	38.34
Reducing sugars/ash	..	..	..	..	1.90	2.12	1.87
Pol per cent. pol cane	4.86	5.90	5.62	6.74	6.79	5.76	5.06
Final Bagasse—							
Tons	295,620	429,961	446,918	489,784	421,275	404,825	461,292
Bagasse per cent. cane	24.14	23.48	24.24	22.74	23.83	24.19	23.30
Pol per cent.	3.09	2.97	3.03	2.63	2.55	2.37	2.99
Dry substance	51.33	52.30	51.63	51.55	51.39	51.69	52.08
Pol per cent. pol cane	4.77	4.64	4.73	4.31	4.48	4.15	4.72
Undetermined loss —							
Pol per cent. pol cane	4.16	1.95	3.18	3.14	3.47	3.22	2.03
Fuels—							
Tons : Wood	3,847	5,175	5,181	3,498	4,909	9,691	6,300
Coal	0	0	0	40	42	111	71
Molasses	6,577	5,951	1,206	6,982	9,093	9,183	1,842

Burdekin District	1951	1952	1953	1954	1955	1956	1957
Cane—							
Tons	809,725	1,095,920	1,306,587	1,503,156	1,255,985	1,303,889	1,382,125
Pol per cent.	16.39	16.08	16.34	15.84	15.87	15.50	16.35
Fibre per cent.	12.39	11.51	11.79	11.55	11.67	12.40	12.15
C.e.s.	15.30	14.92	15.30	14.71	14.70	14.45	15.21
Purity first expressed juice	89.99	89.31	89.32	89.23	88.76	89.70	89.77
Sugar—							
Tons 94 net titre	119,151	161,871	193,483	218,505	179,664	184,607	208,250
Cane per ton sugar	6.80	6.77	6.75	6.88	6.99	7.06	6.64
Pol per cent.	98.58	98.78	98.87	98.82	98.65	98.72	98.52
Net titre	96.80	97.11	97.19	97.23	96.96	96.93	96.38
Dilution indicator	28.1	29.2	27.5	29.5	35.0	31.0	32.4
Pol per cent. pol cane	85.93	87.80	86.59	87.65	86.20	87.47	88.56
Mud—							
Tons	28,901	33,759	46,711	54,491	44,066	46,074	52,525
Mud per cent. cane	3.57	3.08	3.17	3.63	3.51	3.53	3.80
Pol per cent.	2.00	2.39	2.32	2.07	1.82	1.87	1.83
Pol per cent. pol cane	0.43	0.46	0.51	0.47	0.40	0.43	0.43
Molasses—							
Gallons (1,000's)	3,650	4,840	6,204	6,652	5,761	5,623	6,143
Gallons per ton cane	4.51	4.42	4.75	4.43	4.59	4.31	4.44
Brix	90.24	89.78	90.11	91.84	91.10	91.31	92.31
Apparent purity	35.01	32.58	35.26	34.93	34.94	35.76	34.54
True Purity	46.47	43.49	46.97	45.22	44.62	45.24	44.21
Expected purity	..	40.30	40.61	41.19	41.03	41.06	41.83
Reducing sugars/ash	..	..	..	..	1.19	1.15	0.99
Pol per cent. pol cane	5.48	5.42	5.88	6.12	6.18	6.04	5.79
Final Bagasse—							
Tons	204,900	252,031	312,937	340,976	294,263	312,732	331,460
Bagasse per cent. cane	24.97	23.00	23.95	22.68	23.43	23.98	23.98
Pol per cent.	2.81	2.87	3.31	3.08	3.17	2.77	3.19
Dry substance	53.18	54.18	53.93	53.87	53.55	55.28	54.68
Pol per cent. pol cane	4.33	4.05	4.85	4.49	4.69	4.30	4.68
Undetermined Loss—							
Pol per cent. pol cane	3.83	2.27	2.17	1.27	2.53	1.76	0.54
Fuels—							
Tons : Wood	1,844	1,381	2,756	2,124	2,150	3,521	1,837
Coal	130	137	130	69	39	353	0
Molasses	0	0	0	0	0	0	238

Mackay District	1951	1952	1953	1954	1955	1956	1957
Cane—							
Tons	1,161,743	1,589,767	2,467,243	2,616,619	2,386,011	2,462,019	2,702,060
Pol per cent. .. .	16.47	15.86	15.85	14.94	15.40	14.84	15.46
Fibre per cent. .. .	14.01	13.28	13.42	14.40	15.12	15.02	14.77
C.c.s. .. .	15.26	14.72	14.71	13.87	14.22	13.71	14.33
Purity first expressed juice ..	89.42	89.73	88.56	89.54	88.85	88.97	89.60
Sugar—							
Tons 94 net titre .. .	167,265	226,472	354,165	352,362	329,482	323,631	378,793
Cane per ton sugar .. .	6.95	7.02	6.97	7.43	7.24	7.61	7.13
Pol per cent. .. .	98.48	98.84	99.01	98.97	98.86	98.88	98.68
Net titre .. .	96.81	97.56	97.97	97.79	97.57	97.59	97.04
Dilution indicator .. .	28.31	30.4	30.5	26.8	34.3	33.9	29.7
Pol per cent. pol cane .. .	83.27	85.52	86.06	85.74	85.40	84.34	86.70
Mud—							
Tons .. .	35,898	47,380	87,182	90,671	84,049	90,763	103,938
Mud per cent. cane .. .	3.44	3.54	3.65	3.47	3.52	3.69	3.85
Pol per cent. .. .	4.35	3.80	3.28	2.91	2.92	2.72	2.83
Pol per cent. pol cane .. .	0.91	0.78	0.74	0.68	0.66	0.67	0.70
Molasses—							
Gallons (1,000's) .. .	5,999	7,733	12,486	11,575	11,917	10,592	10,456
Gallons per ton cane .. .	5.16	4.86	5.06	4.42	4.99	4.30	3.87
Brix .. .	90.38	89.73	89.57	89.17	90.86	89.73	90.85
Apparent purity .. .	35.56	35.30	34.31	36.07	34.53	36.25	34.10
True purity .. .	43.35	42.35	43.41	43.60	42.89	43.53	41.92
Expected purity .. .	..	40.51	39.42	40.45	39.99	40.25	40.62
Reducing sugars/ash .. .	..	..	..	..	1.40	1.32	1.26
Pol per cent. pol cane .. .	6.32	6.27	6.28	5.92	6.33	6.22	5.15
Final Bagasse—							
Tons .. .	347,350	443,806	697,410	775,206	757,762	785,458	834,597
Bagasse per cent. cane .. .	29.56	27.91	28.27	29.63	31.76	31.90	30.89
Pol per cent. .. .	2.65	2.46	2.97	2.70	2.76	2.60	2.91
Dry substance .. .	50.85	51.41	51.31	52.14	51.41	51.17	51.51
Pol per cent. pol cane .. .	4.80	4.29	5.25	5.35	5.70	5.60	5.81
Undetermined Loss—							
Pol per cent. pol cane .. .	4.70	3.14	1.67	2.31	1.91	3.17	1.64
Fuels—							
Tons : Wood .. .	3,240	2,441	4,229	1,470	1,903	2,852	1,136
Coal .. .	95	96	51	12	0	50	114
Molasses .. .	0	0	0	0	0	0	0

Southern District	1951	1952	1953	1954	1955	1956	1957
Cane—							
Tons .. .	898,140	1,063,030	1,661,517	1,801,103	1,703,813	2,015,122	1,162,153
Pol per cent. .. .	14.07	13.21	13.82	14.08	14.12	14.29	14.91
Fibre per cent. .. .	14.56	14.19	13.52	14.77	14.70	14.17	14.61
C.c.s. .. .	12.69	11.90	12.51	12.91	12.89	13.12	13.68
Purity first expressed juice ..	85.76	85.40	85.90	87.80	87.22	87.81	87.90
Sugar—							
Tons 94 net titre .. .	113,140	124,350	205,019	228,102	212,676	257,460	152,883
Cane per ton sugar .. .	7.94	8.55	8.10	7.90	8.01	7.83	7.60
Pol per cent. .. .	98.80	98.94	98.90	99.00	98.83	98.57	98.49
Net titre .. .	97.24	97.55	97.51	97.68	97.26	96.64	96.44
Dilution indicator .. .	28.6	31.5	29.6	32.8	35.9	34.8	33.5
Pol per cent. pol cane .. .	85.61	84.62	85.03	85.82	84.58	85.75	84.92
Mud—							
Tons .. .	35,971	37,451	57,018	65,650	61,903	71,324	44,428
Mud per cent. cane .. .	4.02	3.56	3.47	3.70	3.69	3.59	3.92
Pol per cent. .. .	2.42	2.70	2.67	2.73	2.91	3.08	2.89
Pol per cent. pol cane .. .	0.70	0.72	0.67	0.72	0.76	0.77	0.76
Molasses—							
Gallons (1,000's) .. .	4,445	5,232	7,678	7,248	7,708	8,117	5,117
Gallons per ton cane .. .	4.97	4.97	4.67	4.09	4.59	4.09	4.52
Brix .. .	91.27	91.77	91.71	91.57	91.84	91.99	91.51
Apparent purity .. .	33.84	34.44	32.75	36.13	36.10	36.62	37.57
True purity .. .	43.72	43.24	41.74	43.00	44.38	45.00	45.55
Expected purity .. .	40.56	41.09	40.40	42.00	42.60	42.8	42.39
Reducing sugars/ash .. .	..	..	..	..	0.88	0.90	0.90
Pol per cent. pol cane .. .	6.92	7.98	6.54	6.42	7.34	6.42	6.94
Final Bagasse—							
Tons .. .	275,890	317,961	477,531	567,691	518,682	588,925	355,219
Bagasse per cent. cane .. .	30.85	30.23	29.17	32.00	30.91	29.66	31.37
Pol per cent. .. .	2.19	2.10	2.46	2.41	2.45	2.78	2.72
Dry substance .. .	50.47	49.87	49.46	49.29	50.73	50.89	50.06
Pol per cent. pol cane .. .	4.83	4.75	5.19	5.48	5.35	5.77	5.72
Undetermined Loss—							
Pol per cent. pol cane .. .	1.94	1.93	2.57	1.56	1.90	1.29	1.66
Fuels—							
Tons : Wood .. .	4,306	3,493	4,774	4,595	4,332	2,693	3,374
Coal .. .	642	511	519	308	108	99	152
Molasses .. .	0	0	0	0	0	0	0

All Queensland Districts	1951	1952	1953	1954	1955	1956	1957
Cane—							
Tons	5,005,172	6,841,536	8,751,063	9,864,305	8,616,163	8,978,081	8,945,617
Pol per cent.	15.68	15.07	15.38	14.64	14.72	14.58	15.34
Fibre per cent.	12.90	12.44	12.69	13.02	13.48	13.59	13.26
C.c.s.	14.50	13.90	14.26	13.50	13.53	13.45	14.24
Purity first expressed juice	88.93	88.21	88.45	88.47	87.97	88.49	89.21
Sugar—							
Tons 94 net titre	704,342	934,614	1,220,383	1,301,245	1,135,675	1,171,870	1,256,271
Cane per ton sugar	7.11	7.32	7.17	7.58	7.59	7.66	7.12
Pol per cent.	98.58	97.78	98.91	98.83	98.75	98.75	98.61
Net titre	96.97	97.38	97.61	97.47	97.33	97.22	96.88
Dilution indicator	28.4	30.5	29.9	29.9	36.5	35.0	32.5
Pol per cent. pol cane	84.79	86.21	85.88	86.00	85.20	85.72	87.07
Mud—							
Tons	139,112	171,787	246,493	274,628	244,303	261,485	258,380
Mud per cent. cane	3.36	3.23	3.36	3.41	3.45	3.52	3.59
Pol per cent.	3.32	3.56	3.02	2.71	2.84	2.60	2.57
Pol per cent. pol cane	0.74	0.70	0.67	0.63	0.66	0.63	0.60
Molasses—							
Gallons (1,000's)	19,044	25,710	34,091	35,721	33,629	31,748	29,717
Gallons per ton cane	4.66	4.62	4.69	4.44	4.74	4.28	4.13
Brix	90.20	90.04	90.22	90.34	91.25	90.72	91.20
Apparent purity	34.59	33.61	34.05	34.84	34.31	34.81	33.89
True purity	44.83	43.32	44.20	43.98	43.90	43.80	43.25
Expected purity	39.92	39.90	39.70	40.20	40.40	40.4	40.56
Reducing sugars/ash	..	..	..	..	1.32	1.30	1.26
Pol per cent. pol cane	5.82	6.25	6.09	6.28	6.63	6.14	5.53
Final Bagasse—							
Tons	1,123,760	1,443,759	1,934,796	2,173,657	1,991,982	2,091,940	1,982,568
Bagasse per cent. cane	27.15	25.93	27.03	27.01	28.10	28.18	27.55
Pol	2.68	2.60	2.91	2.67	2.69	2.63	2.94
Dry substance	51.31	51.82	51.35	51.53	51.54	51.81	51.91
Pol per cent. pol cane	4.69	4.43	5.03	4.94	5.15	5.09	5.28
Undetermined Loss—							
Pol per cent. pol cane	3.96	2.41	2.53	2.15	2.38	2.42	1.52
Fuels—							
Tons : Wood	13,237	12,562	16,940	11,687	13,294	18,757	12,647
Coal	867	744	700	1,152	189	613	337
Molasses	6,577	5,951	1,206	6,982	9,093	9,183	2,080

Tons of cane, tons of sugar, tons of cane per ton of sugar and c.c.s. include all mills. All other figures exclude C.S.R. and Rocky Point mills.

Table X
Tons of Cane per ton 94 Net Titre Sugar, 1948-1957

Season	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957
Tons Cane per ton 94 N.T. Sugar ..	7.07	7.26	7.61	7.11	7.32	7.17	7.58	7.59	7.66	7.12

Table XI
Sugar Produced in Districts, 1957 Season, with Peak Allocations

Districts	Tons 94 Net Titre Sugar			Production per cent. Peak
	Produced	Peak	Excess Production over Peak	
Northern	516,345	479,400	+36,945	107.71
Burdekin	208,250	183,500	+24,750	113.49
Mackay	378,793	311,000	+67,793	121.80
Southern	152,883	230,000	-77,117	66.47
All Districts	1,256,271	1,203,900	+52,371	104.35

Table XII

Figures for 1957 Season (Totals and Arithmetic Averages)

	Northern	Burdekin	Mackay	Southern	All Districts
Tons Cane Crushed	3,699,279	1,382,125	2,702,060	1,162,153	8,945,617
Tons 94 N.T. Sugar made	516,345	208,250	378,793	152,883	1,256,271
Net Titre of Sugar	97.30	96.43	97.07	96.55	96.87
Tons Cane per ton 94 N.T. Sugar	7.21	6.67	7.13	7.77	7.28
C.c.s. of Cane	13.93	15.19	14.35	13.71	14.14
Coefficient of Work	99.19	98.75	97.75	95.33	97.49
Coefficient of Work E.S.G.	94.16	94.42	93.05	91.05	92.90
Crushing Rate	121.53	117.18	118.50	87.50	109.46
Lost Time per cent. Available Time	8.03	5.77	7.75	10.97	8.50
Fibre of Cane	11.25	12.41	14.79	14.58	13.54
Pol of Cane	14.79	16.32	15.47	14.91	15.27
First Expressed Juice—					
Brix	19.80	22.01	21.52	21.10	21.05
Purity	89.17	89.79	89.67	87.85	88.99
Purity—					
Clarified Juice	88.70	88.77	89.32	86.75	88.30
Syrup	88.55	89.07	89.05	86.89	88.27
Dilution per cent. First Expressed Juice	24.01	32.04	29.64	36.62	30.91
Final Bagasse—					
Pol	3.03	3.21	2.89	2.83	2.95
Dry Substance	52.17	54.54	51.37	50.10	51.65
Pol Extraction	95.20	95.07	94.20	94.01	94.51
Reduced Extraction	94.60	95.07	95.20	94.99	94.97
Final Molasses—					
Gallons per ton Cane	4.02	4.43	3.89	4.62	4.23
Brix	90.29	91.88	90.66	90.65	90.76
Apparent Purity	30.92	34.59	34.29	37.59	34.57
True Purity	42.90	44.27	41.87	45.92	43.72
Expected Purity	38.47	41.53	40.73	42.28	40.80
Reducing Sugars/Ash	1.85	1.07	1.26	0.92	1.26
Final Mud—					
Per cent. Cane	2.86	3.61	3.99	4.05	3.69
Pol per cent. Mud	2.70	2.18	3.01	3.04	2.82
Sugar—					
Pol	98.67	98.53	98.70	98.54	98.62
Reducing Sugars	0.33	0.30	0.31	0.27	0.30
Ash	0.21	0.36	0.27	0.34	0.29
Moisture	0.35	0.36	0.30	0.36	0.34
Dilution Indicator	36	32	30	33	33
Pol Balance—					
Sugar (Recovery)	87.57	88.24	86.67	83.85	86.25
Bagasse Loss	4.81	4.93	5.80	5.99	5.49
Molasses Loss	5.01	5.75	5.19	6.99	5.79
Mud Loss	0.51	0.43	0.76	0.80	0.67
Undetermined Loss	2.10	0.65	1.58	2.37	1.80
Recovery overall E.S.G.	87.22	87.85	86.32	83.48	85.89
Recovery on mixed juice	91.99	92.81	92.01	89.18	91.26
Recovery on mixed juice E.S.G.	91.62	92.40	91.63	88.78	90.87
Boiling House Efficiency	96.69	97.24	96.11	94.40	95.88
Boiling House Efficiency E.S.G.	96.31	96.81	95.72	93.98	95.48
Fuels (as equivalent Bagasse per cent. Cane)—					
Wood	0.60	0.33	0.08	1.48	0.67
Coal	0.01	0.00	0.01	0.04	0.02
Molasses	0.12	0.04	0.00	0.00	0.04
Total added	0.73	0.37	0.09	1.52	0.73
Bagasse	24.75	27.51	32.19	31.47	29.53
Total Fuel	25.48	27.88	32.28	32.99	30.26
Crop Days	1,742	729	1,323	896	4,690

Tons of cane, tons of sugar, tons of cane per ton of sugar, c.c.s. of cane and crop days include all mills. All other figures exclude C.S.R. and Rocky Point Mills.

Table XIII
Cane Milled and Sugar Yielded, 1957 Season

Mills	Tons Cane Crushed	* Tons 94 n.t. Sugar made	Tons Cane per ton Sugar	
			1957	1956
Mossman	244,915	34,379	7.124	7.566
Hambledon	330,689	48,215	6.859	7.378
Mulgrave	355,807	49,059	7.253	7.647
Babinda	325,415	43,636	7.457	8.727
Goondi	276,757	38,296	7.227	8.033
Mourilyan	263,069	35,203	7.473	8.227
South Johnstone	395,917	53,693	7.374	7.903
Tully	394,426	52,522	7.510	8.027
Victoria	704,173	102,230	6.888	7.840
Macknade	408,111	59,112	6.904	7.711
Northern District Totals and Averages ..	3,699,279	516,345	7.164	7.871
Invicta	228,763	32,886	6.956	7.616
Pioneer	373,763	56,480	6.618	6.908
Kalamia	379,823	58,091	6.538	7.005
Inkerman	399,776	60,793	6.576	6.981
Burdekin District Totals and Averages ..	1,382,125	208,250	6.637	7.063
Proserpine	408,323	57,282	7.128	7.825
Farleigh	369,160	50,632	7.291	7.685
Racecourse	419,643	58,325	7.195	7.565
Pleystowe	390,533	55,709	7.010	7.559
Marian	348,161	48,445	7.187	7.582
Cattle Creek	181,234	25,260	7.175	7.570
North Eton	222,793	31,709	7.026	7.396
Plane Creek	362,213	51,431	7.043	7.612
Mackay District Totals and Averages ..	2,702,060	378,793	7.133	7.607
Fairymead	182,120	22,933	7.941	8.357
Qunaba	95,672	12,582	7.604	7.770
Millaquin	218,475	29,507	7.404	7.504
Bingera	189,730	25,363	7.481	7.967
Gin Gin	31,875	3,848	8.284	8.396
Isis	215,801	28,398	7.599	7.844
Maryborough	50,786	6,437	7.890	7.540
Moreton	147,717	20,240	7.298	7.129
Rocky Point	29,977	3,575	8.385	7.999
Southern District Totals and Averages ..	1,162,153	152,883	7.602	7.827
All Districts Totals and Averages ..	8,945,617	1,256,271	7.121	7.661

* Local Sales included.

TABLE XIV
Analysis of Gross Time, 1957 Season, excluding C.S.R. and Rocky Point Mills

	Total Hours	Per Cent. Gross Total Hours	Per Cent. of Available Hours
Crushing Time	62,985.73	67.52	92.15
Lost Time—			
Manufacture	2,778.21	2.98	4.06
Cane Supply	2,587.11	2.77	3.79
Total Available Hours	68,351.05	73.27	100.00
Premeditated and Week-end Stops	24,929.06	26.73	..
Gross Total Hours	93,280.11	100.00	..

Table XV
* Fuels Calculated as Equivalent Bagasse Per Cent. Cane, 1951-1957
(Arithmetic Averages)

Year	Wood	Coal, etc.	Molasses	Total Added	Bagasse	Total Fuel
NORTHERN DISTRICT						
1951	0.598	..	1.220	1.818	27.169	28.987
1952	0.598	..	0.640	1.238	27.413	28.651
1953	0.562	..	0.111	0.673	25.413	26.086
1954	0.308	0.008	0.434	0.750	23.952	24.702
1955	0.550	0.010	0.627	1.187	24.945	26.132
1956	1.057	0.025	0.777	1.859	25.402	27.261
1957	0.597	0.011	0.125	0.733	24.753	25.487
BURDEKIN DISTRICT						
1951	0.345	0.040	..	0.385	30.410	30.795
1952	0.305	0.038	..	0.343	28.378	28.721
1953	0.493	0.033	..	0.526	27.118	27.644
1954	0.308	0.015	..	0.323	25.455	25.778
1955	0.380	0.010	..	0.390	26.163	26.553
1956	0.553	0.090	..	0.643	27.523	28.166
1957	0.330	..	0.040	0.370	27.505	27.875
MACKAY DISTRICT						
1951	0.674	0.023	..	0.697	33.349	34.046
1952	0.344	0.025	..	0.369	31.571	31.940
1953	0.293	0.010	..	0.303	28.943	29.246
1954	0.115	0.001	..	0.116	31.401	31.517
1955	0.164	..	..	0.164	32.895	33.059
1956	0.213	0.006	..	0.219	32.961	33.180
1957	0.083	0.013	..	0.095	32.188	32.283
SOUTHERN DISTRICT						
1951	1.362	0.164	..	1.526	34.485	36.011
1952	1.160	0.110	..	1.270	33.614	34.884
1953	0.956	0.078	..	1.034	29.309	30.343
1954	0.845	0.044	..	0.889	31.767	32.656
1955	0.774	0.017	..	0.791	31.980	32.771
1956	0.378	0.012	..	0.390	30.806	31.196
1957	1.480	0.036	..	1.516	31.473	32.989
ALL QUEENSLAND DISTRICTS						
1951	0.818	0.063	0.282	1.163	31.820	32.983
1952	0.648	0.047	0.148	0.843	30.748	31.591
1953	0.589	0.032	0.026	0.647	27.960	28.607
1954	0.414	0.018	0.100	0.532	28.880	29.412
1955	0.474	0.009	0.145	0.628	29.743	30.371
1956	0.510	0.025	0.179	0.714	29.717	30.431
1957	0.669	0.017	0.035	0.722	29.532	30.253

* Excluding C.S.R. and Rocky Point Mills.

Table XVI
Total Crop Days, All Mills, 1948-1957

—	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957
Total Crop Days	5,708	5,593	6,469	4,089	5,046	5,515	6,110	5,397	5,605	4,690

Average Crushing Rates, 1948-1957, excluding C.S.R. and Rocky Point Mills
(Arithmetic Averages)

—	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957
Tons cane per hour	66.33	68.74	72.35	71.47	78.28	87.15	93.51	97.20	102.25	109.46

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